THE YEAR BOOK of ORTHOPEDICS and TRAUMATIC SURGERY

(1955-1956 Year Book Series)

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PUBLISHER'S NOTE The designation (Series 1955-1956) used on the cover and title page of this volume is to indicate its publication during the "series year" which begins September 1955 with the publication of the YEAR BOOK OF MEDICINE and ends in May 1956 with the YEAR BOOK OF PATHOLOGY AND CLINICAL PATHOLOGY

The articles abstracted herein are taken from journals received between November 1954 and November 1955

poses. It steadies and stabilizes and lends support to the head and neck. Also over a period of time this traction will stretch ligaments and restore them to their normal lengths and will relax the spasm of muscles which are shortened due to hypertonicity or to fibrosis within the muscles.

All cervical traction for the neck, shoulder and arm syndrome, whether due to a whiplash injury, arthritis or fibromyositis, is more effective if it is applied with the head and neck in moderate flexion. Every doctor who doubts this should try it for himself. The traction should be directed upward at a fairly sharp angle so that the head is tipped forward. Often I have found unfortunate patients with traction applied in a direct pull toward the head of the bed with most of the pressure of the traction applied to the chin. By adjusting the traction and changing the pulley to an overhead position with the rope placed at an angle of 30-45 degrees from the flat surface of the bed the patients are almost immediately relieved.

The debate or controversy with regard to whether or not the spine should be stabilized by some type of fusion following removal of an intervertebral disk or of a protrusion from an intervertebral disk continues unabated. Many patients are so happy to be relieved of the sciatic nerve pain, as most of them are following removal of a protrusion from an intervertebral disk, that they are willing to accept weakness and instability in the spine which so commonly persists after mere excision of intervertebral disk material. A significant number of patients who have had this removal without any procedure to strengthen and stabilize the spine do develop so much disability that a second operation is necessary. An operation for fusion of the spine months or years after removal of a disk is often very difficult because of scar tissue and increased bleeding.

Many orthopedic surgeons and a few neurosurgeons have arrived at the conclusion that simple interlaminal fusion, or in cases in which there is marked instability of the spine, intervertebral body fusion, should be carried out at the same time that disks are removed. The patient who has undergone surgery for removal of a disk and who subsequently has to go through a second operation for a fusion is most unhappy and dreads the second operation more than he did the fi

Conservatism in the treatment of osteoarthritis of the hip is the trend today in contrast with that of two or three years ago During the past year several articles have appeared in the literature emphasizing the fact that there is still a place for rest, protection from excessive walking or weight bearing on the hip which has become painful because of wear and tear changes within the hip joint, and the use of hydrocortone injected into the joint and of other cortisone like substances administered orally Many patients have been helped if not completely relieved without undergoing the hazards and uncertainties of hip joint arthroplasty of any type. When arthroplasty has been considered advisable the Vitallium cup arthroplasty as described by Smith Petersen has been used much more often within the past two years than in the two or three years just preceding that period This undoubtedly has resulted because many patients who were subjected to prosthesis replacement arthroplasties have continued to complain of pain weakness or instability The orthopedic surgeon should hesitate long before removing a viable head of a femur and replacing that head with a metallic or plastic prosthesis The prosthesis operation should be reserved for patients whose femoral head has undergone death and disintegration following fracture of the cervical neck also for very elderly patients with a subcapital fracture for whom immobilization is undesirable

—Edward L. Compere.

ANATOMY, EMBRYOLOGY, PHYSIOLOGY AND PATHOLOGY

Linear Growth of Long Bones of Extremities from Infancy through Adolescence Continuing studies on the long bone growth of children of the Child Research Council series by Marion M Maresh[1] (Univ of Colorado) have shown that such growth is, at the same time, both complex and orderly Three age periods describe best the linear growth processes—infancy period childhood period and adolescent years

In infancy the growth rate of one or more of the long bones of the extremities was sometimes faster than that of the group average sometimes slower and sometimes revealed periods of either temporary acceleration or deceleration Variations in percentile levels for the humerus radius femur and tibia were observed that might be as great as 50 percentiles but at the extremes of the range—the 1st and 4th quartiles—there was usually little variability, with all bones either above the 75th or below the 25th percentiles

Beginning at about age 3 or 4 and continuing to the prepubescent years the patterns of long bone growth were remarkably stable and orderly Here the changes in percentile levels with increasing age were minimal fluctuations were few and the growth curves for all four bones were usually alike descriptively

In the adolescent years there were variations in onset magnitude and duration of the adolescent growth spurt along with emergence of variations in segmental proportions that will be part of adult body build A comparison of heights during childhood and at the end of long bone growth showed good correlation with about half of the group having early adult heights that were not more than 2 5 cm different from values predicted on the basis of this correlation When the data were separated into two groups—those maturing at earlier than average age and those who were later than average in maturing—significant differences were

(1) A M A Am J Dis Child 89 725 742, June, 1955

found The hypothesis seems to be verified that, in general the *early maturing child will probably be shorter as an adult* than would have been anticipated from the height as a child and the late maturing child will probably be taller as an adult than predicted from the childhood height. The early adult percentile levels for the four long bones followed this same distribution, with the early maturing children usually having lower than childhood percentile levels and the late maturing children having higher than childhood percentile levels in most instances However, the percentile shift for the four bones was not always the same, and often one or two bones seemed to have rates of growth that differed sufficiently from the others to result in rather striking differences in childhood and early adult percentile levels

Anatomic Pitfalls in Surgical Treatment of Torticollis are discussed by Emanuel B Kaplan [2] Such treatment requires not only knowledge of the ordinary textbook anatomy of the neck but also familiarity with the most frequent variations of the muscular vascular and skeletal structures

The muscular variations may involve superficial or deep muscular structures. The platysma may be strongly developed or even consist of a double layer of muscular fibers presenting a problem in treatment because of its intimate connections with the skin (Fig 1) The trapezius muscle may extend its insertion on the clavicle and continue almost directly into the fibers of the cleido-occipital and cleidomastoid completely or incompletely obliterating the space normally observed between the medial border of the clavicular portion of the trapezius and lateral border of the clavicular portion of the sternocleidomastoid muscle (Fig 2) Instead of a continuous muscular layer consisting of union of the trapezius and sternocleidomastoid a separate cleido-occipital head may be observed between the trapezius and the clavicular head of the cleidomastoid (Fig 3) A separate muscular structure is sometimes observed in the space between the trapezius and sternocleidomastoid muscle over the anterolateral aspect of the neck It may be contracted in torticollis and must be divided together with the two heads of the sternocleidomastoid muscle (Fig 4)

(2) Bull. Hosp Joint Dis. 15 154-162, October 1954

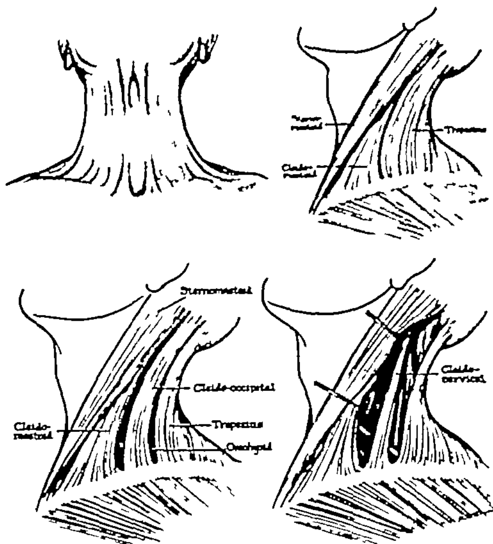


Fig. 1 (top left) Fig. 2 (top right)
Fig. 3 (bottom left) Fig. 4 (bottom right)
(Courtesy of Kaplan, E. B.: Bull. Hosp. Joint Dis. 15:154-162, October 1954.)

Additional muscular formations may be found between the omohyoid muscle and the clavicle (Fig 5) or the hyoid bone and clavicle (Fig 6) These muscles may form contracting bands discernible after the two heads of the sternocleidomastoid are divided A narrow transverse mus- cle may be found between the insertion of the trapezius a: insertion of the sternocleidomastoid muscle (Fig 7)

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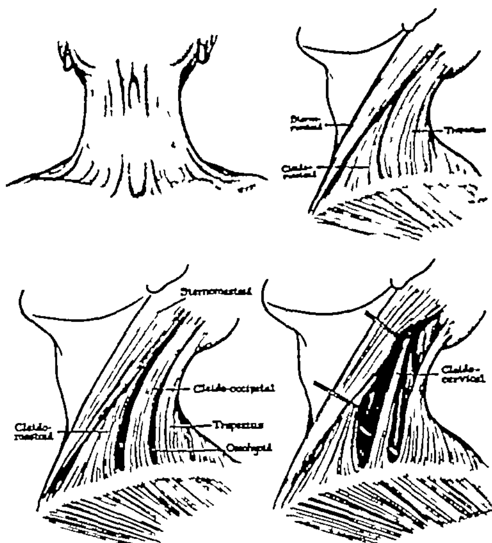


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Quite frequently before piercing the fascia the external

jugular vein divides into two branches One crosses in front or behind the tendon of the sternocleidomastoid muscle and joins a horizontal branch from the anterior jugular and then communicates with the internal jugular the other contin

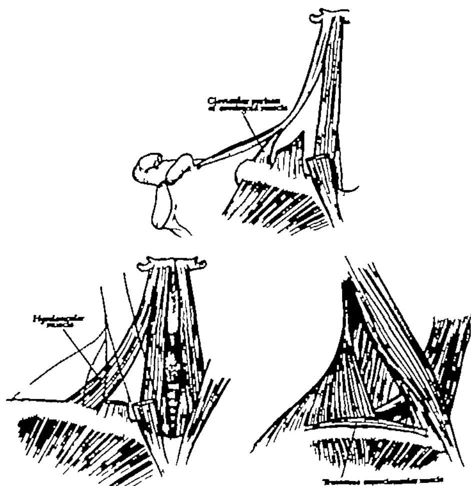


Fig. 5 (top) Fig 6 (bottom left), Fig 7 (bottom right)
(Courtesy of Kaplan, E. B Bull. Hosp Joint Dis. 15:154-162, October 1954)

ues the usual course of the external jugular and joins the subclavian (Fig 8) Occasionally a fairly large vein is found between the external jugular in front of the sternocleidomastoid muscle and the first intercostal space, where the vein penetrates to join the first intercostal or the internal mammary vein This branch must be carefully avoided (Fig 9) Immediately posterior to the clavicle is the suprascap-

ular (transverse scapular) vein It is usually of consider
volume and may be easily injured when exploration is
ried posterior to the clavicle (Fig 10)

In certain cases congenital aberrations may be prese

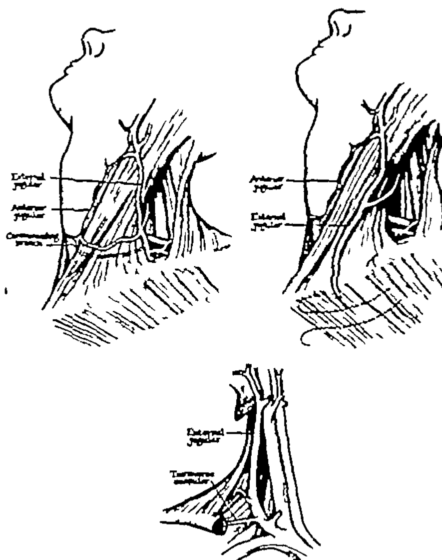


Fig. 8 (top left) Fig. 9 (top right) Fig 10 (bottom)
(Courtesy of Kaplan E. B : Bull. Hosp. Joint Dis. 15:154-162 October 19

the atlanto-occipital joint which are not easily evider
routine roentgenography The depression of the for
magnum into the skull may be connected with chang
the position of the neck resembling torticollis

Regeneration of Blood Vessels in Tendon Transplants. S Teneff and G Fonda[3] (Turin Italy) studied fresh auto- homo- and heteroplastic tendons and tendons preserved in 90% alcohol, formalin or ether The metabolism of tendon is low and therefore does not depend on good vascularization. Its nondifferentiated cytologic structure has good reactive and proliferative possibilities Besides the possibility that



Fig 11 (top) —Autoplastic frozen transplant five days after implantation note limited revascularization in center of transplant, with vessels growing out of peritendinous tissue. Arrows show connection of transplant ×5

Fig 12 (bottom) —Homoplastic frozen transplant 15 days after implantation; note good revascularization, with vessels from peritendinous tissue and from ends of primary tendon. Arrows show the connection, ×5

(Courtesy of Teneff S., and Fonda, G Arch. orthop. u. Unfall-Chir 47:449-462, 1955)

tendon tissue will produce an even vascularization in a short time is important in relation to probability of good fusion of a transplant

Tendon transplants of various types were made in the right Achilles tendon of adult rabbits and representative specimens taken 3-45 days after implantation. Blood vessels were demonstrated by injection of India ink.

Fresh autoplastic transplants showed no vascularization at end of three days and some necrotic changes were seen.

(3) Arch. orthop. u. Unfall-Chir 47 449-462, 1955

After 5 days the transplant was surrounded by well vascularized tissue which sent out vessels into the transplant 10 days after transplant vascularization of the surface and of both ends of the transplant had occurred In 15 days vascularization in the entire tendon was good There are then more vessels in the transplant than in the primary tendon

In 15 day specimens of frozen autoplastic tendon transplants regular longitudinal vascularization was demonstrated whereas 5 day specimens showed several areas of tissue destruction (Fig 11) Vascularization of frozen homoplastic transplants at 15 days was better and more irregular than the same stage of the fresh autoplastic graft (Fig 12)

Vascularization was similar in frozen heteroplastic transplants In all four instances there is first absorption of vital tissue which is replaced by regenerative tissue with fibroblasts and blood vessels Vessels grow from the surrounding tissue or from the ends of the primary tendon Up to 20 days after operation the new vessels are irregular in distribution but later become regular straight and longitudinal The presence of adhesions between surrounding tissue and tendon is important in vascularization The adhesions later decrease when the longitudinal vessels from the ends of the primary tendon migrate into the transplant.

Freeze-Dried Arteries Used as Tendon Sheaths is discussed by D R Koth and W H Sewell[4] (Bethesda Md) In tendon surgery a major problem is the prevention of adhesions and maintenance of free gliding motion It is thought that adhesions are initiated by the paratenon and surrounding tissue and not by the tendon itself Procedures designed to prevent these adhesions operate in one of two ways In one a new smooth walled tunnel is allowed to form around a tubular mold to provide a gliding surface for the tendon after the mold is removed In the other the tendon is sheathed during healing with a substance that is less likely to adhere to the tendon than to surrounding connective tissue Of the inorganic and organic materials used in the latter procedure only polyethylene was satisfactory However when it was used the time required for tendon healing was doubled

(4) Surg Gynec. & Obst. 101 615-620 November 1955

The authors tried freeze-dried homologous arterial implants and found that when these were placed around traumatized tendons as a sleeve they prevented adhesions between tendon and surrounding tissue. Fibroblasts replaced the implant and a new gliding surface was provided for the tendon Freeze-dried heterologous arterial implants used in the same manner were not successful because of excessive fibrosis and scarring In the presence of infection the freeze-dried material was wholly or partially destroyed.

This method of preventing adhesions between a tendon and the surrounding tissues may be a useful adjunct to clinical technics of tendon surgery

Effects of Locally Applied Estrogen on Pubic Symphysis and Knee Joint in Castrated Mice were investigated by E. S Crelin and A L Haines[5] (Yale Univ) Male and female mice aged 5 weeks were used One implant of estrone particles was placed in contact with the dorsal surface of the pubic symphysis and one under the patellar ligament of the left knee of each mouse. Thirty days later the animals were killed. Changes in estrogen responsive tissues remote from the implants revealed that the implants were sufficient to produce a systemic effect In each mouse the symphysis was flexible and the interpubic gap measurable. Partial resorption of the pubes occurred in the same manner as that described with subcutaneous estrogen injections The degree of resorption of the pubic articular caps of hyaline cartilage and replacement of the symphysial fibrocartilage by dense collagenous connective tissue was variable.

The cartilages and ligaments of the knee in each mouse were normal however medullary bone formation occurred in the patella and in the epiphysis and metaphysis of the femur and tibia In these bone-forming regions the marrow cavities of a number of mice were almost completely replaced with coarse, irregularly oriented bony spicules An extensive proliferation of reticular fibers occurred in the areas of the marrow cavities where the bony spicules were probably being formed The epiphysial plates were thinner than those of untreated control mice These changes also occurred in the untreated contralateral knee

(5) Endocrinology 56 461-470 April, 1955.

Although 9 week old untreated, male and female control mice were castrated three weeks before puberty a definite sexual dimorphism of their pelves developed

Biophysical Studies on Bone Tissue XII Experimentally Produced Ectopic Bone Tissue Bengt Engfeldt and Arne Engström[6] (Karolinska Inst Stockholm) studied ectopic bone by biophysical methods and compared it with normal bone tissue and with bone tissue obtained from patients with osteogenesis imperfecta

TECHNIC.—Injections of 1 2 ml of 40% ethanol were made at several locations in the biceps and quadriceps of four young rabbits. After three months two macroscopic bone specimens 5 mm. in diameter, were found at the injection sites In the other instances only hard scar tissue was observed. Thin sections of the ectopic bone were obtained by grinding For this purpose the small pieces of ectopic bone were embedded in plastic. For comparison, longitudinal and transverse sections from the long bones of young rabbits were prepared by grinding Sections of the bone from patients with osteogenesis imperfecta were obtained in a similar way

The tissue of the ectopic bone showed a rather high and even mineralization and most of it greatly resembled lamellar bone. Vascularization was rich. At some sites structures with a low content of mineral salts were seen and sometimes these structures resembled haversian systems Minor areas which showed evidence of resorption were also found

Decalcified sections showed in polarized light a well organized fiber pattern with rather broad but not especially long bundles running in somewhat different directions In transmitted light the bone tissue appeared moderately cellular and in some areas it had a coarse fibrillar structure

Study of the in vitro uptake of radioactive phosphate and calcium in the ectopic bone tissue showed that it took place at several sites. The major part of the labeling in vitro occurred in structures with a low degree of mineralization which is in agreement with the results of previous experiments

In its general type the ectopic bone tissue has some features in common with the bone tissue formed in patients with osteogenesis imperfecta In the latter an immature la

(6) Acta orthop. scandinav 24:85-100 1954

mellar type of bone is formed which is only partially rebuilt and thus the normal development of the bone tissue is disturbed

Results tend to indicate that ectopic bone produced in rabbit has a molecular structure and composition similar to that of ordinary rabbit bone

Evaluation of Accretion Resorption and Exchange Reactions in the Skeleton was made by Goran C H Bauer Arvid Carlsson and Bertil Lindquist[7] (Univ of Lund) who developed certain computation technics for this purpose They found that in rapidly growing young rats the amount of Ca added through accretion during one hour is about 0.25% of the total amount of Ca present in the whole tibia. The net increase in Ca is only about one fourth of the accretion the resorption constituting three fourths Such an uneconomical type of growth is apparently resorted to in order to preserve the complicated architecture of the bone during its increase in size. In the whole tibia about 3% of the Ca belonged to the exchangeable fraction In the proximal part of the tibia shafts of normal infants the percentage of bone salt added through accretion was about 0 05% i e. five times lower than in the tibia of the young rats

In the bones of young rats the accretion rate was directly proportional to the increase in weight of the body as a whole Accordingly the rate of accretion diminished with age. The resorption rate shows a similar relation to growth and age. The relative importance of exchange reactions seems to increase somewhat with age.

Fracturing the femur shaft of mature rats resulted in an eightfold increase of the accretion rate. The ratio of the Ca^{45} of the injured femur shaft to the Ca^{45} of the uninjured femur shaft remained unchanged one, two and four days after injection of the isotope The same ratio was obtained whether the uptake of Ca^{45} was mainly due to exchange or to accretion

It was found that besides serving to maintain the normal architecture of the bones the resorption process is mainly responsible for the role of the skeleton in the Ca homeostasis of the body

(7) Kungl. fysiograf Sällsk i Lund Förhandl., vol. 25 no. 1, 1955

In a study of the femora of nontreated and vitamin D treated rachitic rats it was observed that the rate of accretion of Ca in the femur was more than doubled by vitamin D and an increase in the size of the exchangeable Ca fraction was also observed

Studies also showed that bone resorption is an active process requiring the presence of vitamin D for normal homeostatic function It is concluded that the antirachitic and calcemic" effects of vitamin D represent different degrees of the same action and not different mechanisms Further investigations indicated that vitamin D acts on bone resorption by stimulating production of citric acid in the bones

Effect of Oscillating Bed and Tilt Table on Calcium Phosphorus and Nitrogen Metabolism in Paraplegia Paraplegia is followed by metabolic changes characterized by disuse osteoporosis hypercalcinuria and negative nitrogen balance The disuse osteoporosis is due to failure of osteoblastic activity resulting from lack of "stresses and strains" on bone. Such stresses and strains might consist of direct weight bearing through bone circulatory changes in bone or muscular pulls on bone acting either singly or in combination The metabolic changes notably in calcium metabolism return to normal only on ambulation which is rarely possible before the fourth month after injury

In five paraplegic patients who were still immobilized Derek M Wyse and C J Pattee[8] (Queen Mary Veterans Hosp Montreal) tried to imitate ambulation by means of the oscillating bed and the tilt table The effect of the oscillating bed was believed to be via changes in the circulation to the paralyzed extremities that of the tilt table by direct weight bearing through the bones of the lower extremities

Calcium balance studies and roentgenographs did not demonstrate any significant effect of these procedures Studies of nitrogen metabolism revealed that anabolism or equilibrium was attained in all patients, provided adequate nutrition was available following injury No significant effects on nitrogen or phosphorus metabolism basal metabolic rate renal function tests or urinary 17 ketosteroids were observed by the use of the oscillating bed or tilt table

(8) Am. J Med. 17:645-661 November 1954

phy The trabeculae are fewer and thinner than normal In the spine this causes the vertebrae to shrink and be compressed, chiefly in the central part (so-called fish vertebrae) The intervertebral disks expand and become biconvex. The nucleus can absorb water and enormously increase in size The spine becomes kyphotic and shorter than normal Osteoporotic deformities are usually most advanced in the lumbar region Histologically, there is too little bone but what bone there is has normal structure

Except in grosser deficiencies of protein and mineral intake or absorption it is doubtful if malnutrition commonly produces osteoporosis Lack of vitamin C produces defective matrix formation and hence one variety of osteoporosis Osteoporosis is found in such endocrine disturbances as primary gonadal insufficiency hyperthyroidism hyperparathyroidism acromegaly and Cushing s syndrome

Immobilization is the chief mechanical factor Absence of normal stresses and strains is thought to remove some of the stimulus to bone formation by osteoblasts, whereas normal resorption by osteoclasts continues unchecked

Symptoms vary from none to complete incapacity from severe pain Pains are mainly in the back radiating around the trunk to the buttocks and down the legs They are usually aggravated by movement Compression of the spinal cord does not occur Physical signs vary from none to gross spinal deformity the commonest being shortening of the trunk, with a rounded kyphosis and a transverse fold of skin across the upper abdomen Serum calcium phosphorus and alkaline phosphatase levels are normal X-ray findings are characterized by biconcave vertebral bodies with denser end plates The condition is most pronounced in the spine. The column shows a rounded kyphosis which may be due solely to disk degeneration Individual vertebrae may show wedge shaped deformity All degrees of collapse occur

Differential diagnosis includes osteoporosis due to hormonal dysfunction myeloma, osteolytic type of Paget s disease and so-called idiopathic osteoporosis which occurs in young persons of either sex, without demonstrable endocrine defect and is unresponsive to hormonal treatment

Essentials of treatment are physical activity (at least sit-

ting in a chair), a light spinal jacket if pain is severe, diet high in protein, with a pint of milk daily, and hormonal therapy Male and female hormones should be given intermittently probably for not less than two years Subjective improvement sets in soon but x ray signs persist a long time.

Availability of Exchange of Skeletal Water, Sodium and Calcium Göran C H Bauer and Arvid Carlsson[1] (Univ of Lund) studied the rate and magnitude of exchange between serum and bone of water sodium and calcium with the aid of isotopes

It was found that bone water is all completely exchangeable as evidenced with intravenously administered D_2O as indicator The rate of exchange is rapid over 90% of bone water being exchanged within 4 hours and 100% within 24 hours

As measured with Na^{22} dilution technic, bone water sodium is all exchangeable at a rate which compares with that established for bone water The excess sodium of bone does not all exchange with serum sodium Thus after subcutaneous administration of Na^{22} to adult rats it was found that about 40% of this excess sodium rapidly exchanges with serum sodium

Only a small fraction of bone calcium is exchangeable with serum calcium It seems probable that the exchangeable calcium calculated on the entire skeleton does not exceed 1% The rate of exchange is probably in the same range as that of sodium and water in bone.

Studies on Osteogenesis Around Autoplastic Bony Transplants in Bony Defects Arvid Hellstadius[2] (Sodersjukhuset Stockholm) observed in animal experiments that osteogenesis around autoplastic bony transplants in bony defects was much more profuse and more massive than the extremely scanty new bone on bony transplants implanted in soft parts This was the case even before bony connection had been established between transplant and host bone Therefore osteogenesis on these transplants could not have taken place by means of osteoid tissue growing from the host bone to the transplant New bone on transplants in bony defects

(1) Acta orthop scandinav 24 275-277 1955
(2) Ibid pp 278-285

originated next to the host bone from which point it proceeded along the transplant The host bone must in some way have had a stimulating influence on osteogenesis around the transplant It was not found that transplants in soft parts stimulated osteogenesis in adjacent transplants

Rate of Bone Salt Formation in Healing Fracture Determined in Rats by Means of Radiophosphorus Göran C H Bauer and Arvid Carlsson[3] (Univ of Lund) state that during 10-14 days following a fracture in rats the rate of bone salt formation in the fracture callus increases from day to day Thereafter this rate gradually diminishes In an earlier radiocalcium experiment it was found that the newly formed bone salt of the 7 day old fracture callus is reached by a resorption process not earlier than about four to five days after its formation

In their present radiophosphorus experimental series the authors demonstrated that even in the 14 day old fracture callus in rats the newly formed bone salt stays unremoved during at least the initial four day period The rate of formation of bone salt in the fracture callus can therefore be determined from the activity values

Bone and Cartilage Formation by Periosteum Assay of Experimental Autogenous Grafts. Jonathan Cohen and Pierre Lacroix[4] claim that the value of a bone-grafting procedure depends on the mechanical support it provides, on the character and amount of repair tissue elaborated by the recipient tissue elements in relation to the graft and on the production of intercellular material by the graft—that is its osteogenetic potency They devised a standardized method of assay of the ability to produce bone by a tissue to be used for grafting The autogenous periosteum of rabbits was studied by this method and the osteogenetic potency of the tissue was found to vary considerably depending on the age of the animal and the character of the recipient bed used. In situ grafts on the tibia were most successful subcapsular grafts on the kidney moderately so and grafts into the anterior chamber of the eye showed the least amount of osteogenesis The formation of cartilage by grafts of periosteum

(3) Acta orthop. scandinav 24:271 274 1955
(4) J Bone & Joint Surg. 37 A:717 730 July 1955

was frequently noted The local stimuli to bone and cartilage formation are believed to be primarily chemical rather than mechanical or circulatory

Experimental Bone Transplants Robert S Siffert[5] (Mount Sinai Hosp New York) performed 157 bone and callus transplantations to ulnar defects or the gluteal muscles of rabbits. The specimens were studied by routine histologic methods as well as by stains for collagen, alkaline phosphatase and phosphates

Although homogenous bone was usually well incorporated the best results were obtained with autogenous iliac bone. Shave grafts of tibial bone incited extensive osteoclastic and fibroplastic reactions and were almost completely destroyed before healing of the defect occurred. The transplants appeared to serve primarily as a passive scaffolding or guide wire along which new bone grew There was no evidence that the bone graft beds responded to any direct factor stimulating osteogenesis within the transplants Necrotic fragments remained completely dormant until they were contacted by the invading trabeculae growing in from the bone ends and periosteum at the margins of the defects

Alkaline phosphatase demonstrated primarily in preosseous cartilaginous and fibrous callus is always present during bone matrix deposition Although phosphatase and phosphate deposition are usually concurrent processes a phosphatase laden matrix is often demonstrable before phosphates are deposited in both enchondral ossification and callus formation It therefore appears that, although alkaline phosphatase is undoubtedly related to the calcification mechanism liberating phosphates from organic esters the enzyme is primarily involved in the mechanisms associated with matrix elaboration.

Although peripheral areas of trabeculated iliac bone and of callus transplanted to muscle tissue occasionally survived all such transplants to bone defects became necrotic, indicating that the speed of revascularization of a graft bed is probably the principal determining factor in maintaining viability of transplanted elements

(5) J Bone & Joint Surg 37 A 742 758, July 1955

Experimental and Clinical Use of Bone Milled in Kitchen Blender is described by Norman Rosenberg, Rudolph Reich and Malcolm Brahms[6] (Mount Sinai Hosp., Cleveland). To make bone grafts more accessible to the host many are now transplanted in the form of chips. Because surgical production of these chips with or without a bone mill is tedious and the chips are large, the authors tried a kitchen blender to mill bones.

Animal experiments revealed that there was no discernible difference in behavior of cancellous and cortical bone when both had been blenderized. Furthermore, autogenous cortical drill shavings promoted formation of osteoid tissue in new bone as well as the blenderized cortical autogenous specimens; however, drill shavings were larger and were still identifiable in the graft site at 21 days, when practically no blenderized bone could be recognized. Frozen homogenous bone was less acceptable to the host and showed more fibrous tissue reaction than frozen autogenous bone even though both had been blenderized.

In clinical trials blenderized bone was first used as a supplement to open reduction in treatment of fractures, placed around the fracture site but not between the living fragments. Later it was added to other bone grafts in treatment of nonunion and occasionally as the only transplant with a metallic plate and screws. It was also used to fill defects caused by benign tumors and giant cell tumor and was applied in cases requiring spine fusion for different indications.

The blenderized bone was used in 41 patients, homogenous bone being applied in 29 and autogenous bone in 12. Four patients could not be followed. In the rest, follow-up was one to five years. There were three failures. One of these occurred with the use of autogenous cortical bone in a giant cell tumor. Clinically the lesion was diminished in size and the patient is asymptomatic. One occurred when 100 cc. of freezer stored homogenous bone was blenderized to fill an osteomyelitic cavity. Subsequently the bone was removed. The third failure occurred when freeze-dried homogenous bone was used in a lumbosacral fusion. The wound did not

(6) Surg., Gynec. & Obst. 101 545-557, November 1955.

heal and the graft was removed though there was no clinical evidence of infection

It is believed that bone transplants should be in the form of small particles whenever stability is not a factor and that the kitchen blender is a simple and efficient instrument for making these particles

Replacement of Bone Defects in Dogs with Circumferential Autografts and Homografts Fixed with an Intramedullary Nail was studied experimentally by William T Fitts, Jr Brooke Roberts Jacques Jenny William Grippe and Warner Sheldon[7] (Univ of Pennsylvania) The dogs were observed for three weeks preoperatively during which time they received homologous anti-canine distemper serum and a five day course of sulfamerazine 1.5 Gm daily by mouth. Postoperatively, they received 100 000 units of penicillin intramuscularly daily for five days

Grafts were unsuccessful in almost all 14 dogs (group A) having both femurs operated on simultaneously with use of a V shaped intramedullary nail which did not securely fix the distal fragment. Within the first few weeks five died of malnutrition and severe wound infections Nine animals sacrificed at four months showed scattered areas of fibrous union or bony bridging in six instances but nonunion in the remaining grafts In all dogs the proximal end of the graft appeared to have united better than the distal Microscopic examination showed varying degrees of infection nonunion and sequestration of ununited grafts

The 24 homografts and 14 autografts in group B were much more successful Only one femur was used. Better fixation was provided by a long three flanged intramedullary nail (Figs 13 and 14) About half the grafts united with maintenance of full length of the femur Of the last 12 operations 9 were successful

Mechanical factors of fixation seemed to determine results of the experiments Better results of later experiments are attributed to solid fixation by the long three flanged nail inserted far into the distal fragment. Homografts were just as successful as autografts Microscopic examination of the periosteal reaction noted in autografts and not in homografts showed that it consisted of transversely trabeculated

(7) Ann. Surg 142 351 360 September 1955



Fig 13 (left) Homograft immediately after nailing Note three-flanged nail and good fixation of proximal and distal fragments, with nail driven well into distal fragment and impinging on distal cortex

Fig 14 (right) Homograft 12 months postoperatively and 2 months after removal of nail Note that graft held up well

(Courtesy of Fitts, W T Jr et al Ann Surg 1[illegible] 351 160 September 1955.)

callus probably indicating that the periosteum of the autograft remains alive however this condition did not seem to make the autografts heal more successfully than the homografts

Vascularization of Bone Actual State of Our Knowledge was critically studied by E Rutishauser Ch Rouiller and R. Veyrat[8] (Univ of Geneva) Macerated bone specimens

(8) Arch. "Putti" chir org movimento 5 9-40 1954

were examined and the location and diameter of the vascular orifices determined Radiopaque substances were injected and the ramifications of the nutrient vessels studied Contrast mediums were injected into the arteries (arteriography) and into the medullary cavities (intramedullary phlebography) Neoprene and India ink were injected for macro- and microscopic study of fine capillary structure. In addition experimental occlusions were performed to study the effects of vascularization in the nutrition of bone and to delimit the areas nourished by each of the vessels

The authors conclude that the arterial supply is multiple and not limited to one or two nutrient arteries in the long bones, the periosteal metaphysial and epiphysial arteries assure by their number sufficient vascularity The capacity of the venous system is so great that the inequality between the volumes of venous and arterial blood is even greater in the bones than in the other organs The veins are numerous and those of the diaphyses play a predominant role in the return circulation The capillary network of the marrow is exceptionally dense The characteristic appearance of the marrow is due to dormant capillaries There are many vascular areas joined by collateral circulation The capillary blood supply of the bone marrow is comparable to that of an organ as vascular as skeletal muscle This vascularity participates in variations of the cardiac output and in certain diseases characteristic of the marrow it is specifically augmented.

Paget s disease produces important circulatory modifications The blood flow in a bone involved with this process is rapid and the oxygen tension of the venous blood is abnormally elevated

Study of Arterial Vascularization of Femoral Neck in the Adult, using the injection technic of Trueta and Harrison was made by J Judet R Judet J LaGrange and J Dunoyer[9] (Paris) on 65 cadavers of adults aged 28-63

The most important arteries are the superior group which enter the bone through the superior rim of the neck they originate from the medial femoral circumflex artery or from its anastomosis with the lateral femoral circumflex artery

(9) J Bone & Joint Surg 37 A 663-680 July 1955

the obturator artery and the inferior gluteal artery Anastomosis occurs next to the trochanteric fossa Sometimes on entering the bone these arteries wind into a few spirals (Fig 15) Two groups of inferior arteries given off by the medial circumflex artery which follows the lateral capsular inser-



Fig 15 —Frontal slice Arteries supplying the neck originate far laterally near the trochanter Note anastomoses with lateral inferior group (Courtesy of Judet, J., et al. J Bone & Joint Surg 37 A 663-680 July 1955)

tion—the small vessels of the lateral inferior group and the more important vessels of the medial inferior group—penetrate the bone close to the cartilaginous border of the femoral head and anastomose freely with arteries from the superior and lateral inferior groups The arteries of the anterior and posterior aspects of the neck are more irregular and end in the cortex forming a peripheral meshwork of fine arterioles given off by lateral and medial circumflex ar-

teries between synovial membrane and the bone with many anastomoses Each group of arteries also anastomoses with adjacent systems The superior and medial inferior groups anastomose with the arteries of the femoral head. Parallel anastomoses always occur at the site of the former epiphyseal plate The superior group is also connected with the trochanteric vascular system Terminal branches from the superior arteries of the neck anastomose completely with diaphyseal vessels In both head and neck, arterioles in the red hematopoietic marrow terminate at wide thin walled sinusoids, which gather to form lobules of the marrow The fat marrow contains capillaries draining out into veins In the specimens studied no vascular change was noted which could be correlated with age, but some specimens showed more vascularity than others owing to greater or lesser amount of red marrow in the neck.

Whatever surgical approach to the hip is used the blood supply to the head and neck should be preserved. Extensive distal capsulectomies and especially destruction of the lateral capsular attachment must be avoided as well as any procedure harmful to the important superior arteries of the neck The synovial membrane covering the bone around the neck should not be disturbed. In hip arthroplasty with insertion of a prosthesis drilling the central portion of the neck and reaming the cervical stump to adjust the neck to the collar may produce severe vascular damage, not demonstrated clinically and roentgenologically until several months later In such operations the superior arteries must be conserved Prostheses with a narrow stem must be used, to spare intraosseous vessels Reaming and shaping of the neck is now avoided by use of a new small stemmed prosthesis and no collar During oblique resection of the head the inferior medial arteries are left intact Too early weight bearing is proscribed

In femoral neck fractures prognosis does not rest on vascular factors alone but vascular damage is proportional to the displacement of the fragments In all fractures with marked displacement whatever the site and direction of the fracture line the capital fragment is deprived of most of its vascular supply and what remains cannot maintain viabil

ity In a fracture of a femoral neck whose main arteries issue from a bifurcation of the cervicocapital arteries (as in 20% of the specimens) the main part of the superior, as well as the medial inferior arteries is destroyed If reduction of the fracture is not perfect if immobilization is not complete and if weight bearing is started too early pseudarthrosis with resorption of the neck will result Sometimes such fractures do heal because of revascularization of the neck and head by creeping substitution or peripheral vascularization Fractures at the base of the neck which follow the capsular insertion heal badly probably because they interrupt most of the arterial supply of the neck.

Localization of Isotopes in Bone Grafts by Autoradiography was studied by Clifford L. Kiehn James Gutentag and Donald M Glover[1] (Western Reserve Univ) Autografts of bone were implanted subcutaneously in rats and P^{32} injected intravenously The grafts were removed at intervals and the tissue processed using the Pele film stripping technic The grafts were found clinically to be integrated into the host tissue and could be removed only with difficulty There was some diminution in size In those implanted with marrow cavity the marrow appeared still active on removal as long as 60 days after transplantation

With high doses of P^{32} (500 mc) the radioautographs showed excessive exposure and scatter With 100 mc the highest concentration of exposure appeared at the margins of the bone spicules but no cellular localization was possible. Uptake in individual cells of adherent marrow was apparent with doses of 25 mc

When bone transplants which had been in the recipient site for less than 15 days were processed no P^{32} uptake could be seen The first abundant evidence of uptake was not observed until the 15th day This was manifested throughout the graft and particularly along the trabeculae of the graft A 15 day old control taken from the intact ilium of the same animal showed the isotope distributed along the trabeculae in the typical position In a 30 day old autograft P^{32} was more abundant and distributed irregularly throughout the graft The distribution was more orderly in a control section

(1) Plast. & Reconstruct. Surg 14:425-430 December 1954

halation or ingestion become localized in specific "hot spots" in the skeleton. These localized areas of high radioactivity may become the cause of radiation sickness and eventually also of malignant transformation of bone tissue.

The authors' studies of the in vivo and in vitro uptake of Sr^{89} in bone tissue of dogs, using radioautographic and microradiographic technics, showed that labeling with Sr^{89} occurs in certain bone structures which have a low content of mineral salts and which are newly formed. Both in vivo and in vitro distribution of Sr^{89} in the bone tissue follow the general patterns which characterize phosphorus, calcium and sulfate.

Experimental Study of Polyvinyl Sponge as Substitute for Bone. A. Morgan Struthers[3] (Mayo Found.) carried out experimental studies on nine young adult dogs to determine the manner in which polyvinyl sponge is tolerated by osseous tissue and the manner in which osseous tissue grows about and within the sponge. Experiments were so designed that polyvinyl sponge with and without transplants of chips of autogenous bone and smaller particles of autogenous bone could be placed in contact with skeletal tissues (periosteal bed of ribs) and extraskeletal tissues (rectus abdominis muscle) and also be embedded within cancellous bone (sternum).

It was found that polyvinyl sponge alone or with transplants of autogenous bone is tolerated by skeletal tissues for at least 20 weeks without gross or microscopic evidence of foreign body reaction. New bone will grow about and within the sponge from skeletal tissues within four weeks but does not completely infiltrate the sponge during at least 20 weeks. This bone growth occurs most consistently from adjacent cancellous bony surfaces and is increased by the addition of chips or smaller particles of autogenous bone to the implant of sponge.

Methionine-Induced Amino-Aciduria in Vitamin D Resistant Rickets was observed by William H. Fishman[4] (Tufts College) in two children. The methionine also increased excretion of hydroxyamino acids. The urinary data of the two

(3) Plast. & Reconstruct. Surg. 15:274-289, April, 1955.
(4) Metabolism 4:107-109, March, 1955.

children resembled the amino-aciduria of the rachitic children reported by others as follows there are present excessive amounts of arginine and lysine and of hydroxyamino acids in the presence of normal levels of leucine isoleucine, valine and methionine. Improvement of bony rickets as judged by x rays was noted in one child after a six week course of viosterol (45 000 USP units daily) following the period of methionine administration

The mechanism of methionine induced amino-aciduria in children with resistant rickets is unexplained but is probably concerned with methionine and serine metabolism

Calcium Absorption and Vitamin D It is generally agreed that the initial site of action of vitamin D is on either the calcium absorption mechanism or the bone The effect at both sites has been demonstrated repeatedly

B B Migicovsky and J W S Jamieson[5] (Canada Dept. of Agriculture Ottawa) studied calcium absorption in chicks using the Ca^{45} method of measuring relative absorption They found that the rate at which Ca^{45} administered orally appears in blood and bone of chicks is greatly affected by vitamin D Absorption of Ca^{45} from an intramuscular dose is not influenced by either vitamin D or the calcium content of the diet The interaction of the amount of Ca^{45} in the oral dose and vitamin D on the amount of calcium absorbed indicated that the vitamin D effect on the absorption is a function of the quantity of calcium presented for absorption Absorption experiments carried out with chicks fed diets of varying calcium content showed that vitamin D enabled the chicks to adapt the capacity to absorb calcium to different dietary intakes of calcium

The mineralization effect of vitamin D quantitative and qualitative could be explained by the assumption that bound calcium is deposited more readily and in a more regular fashion In the absence of vitamin D where a high calcium diet yields a more mineralized but histologically abnormal bone the deposition of calcium probably depends on the irregular excess of calcium that is delivered to the blood via the intestinal barrier

(5) Canad J Biochem. & Physiol. 33 202-208 March 1955.

Experiences with Ossopan in Orthopedic Diseases are reported by O Popp[6] (Vienna) Ossopan is a complete bone preparation from animals in the growth age The preparation was administered by mouth six times daily in the same dosage to adults and children Only patients with typical disease were studied

In two patients with chronic osteomyelitis of the tibia and a large postoperative bone defect healing was rapid after ossopan was given Good response was also obtained in several patients treated with bone chips and bone grafts Two patients with femoral radiolucent transverse bands (*umbauzonen*) two with hip arthrodesis and two with subtrochanteric osteotomy were also treated with good results Five of six patients with joint or bone tuberculosis given ossopan in addition to antibiotics had good healing and recalcification in a shorter time than patients not given ossopan Good results were obtained in three cases of Sudeck s atrophy one of pseudarthrosis and one of retarded fracture consolidation Of 10 patients with senile osteoporosis 5 were relieved of symptoms and 3 improved Treatment was unsuccessful in cases of disturbance of enchondral ossification congenital tibial pseudarthrosis Paget s disease aseptic necrosis of the hip and fibrosarcoma of the femur

Radiologic Bone Changes and Angiographic Findings in Leprosy with Special Reference to Pathogenesis of "Atrophic" Conditions of Digits were studied by D E. Paterson[7] (Vellore South Indian Union) Specific bone destruction due to Mycobacterium leprae is found mainly at the ends of phalanges and metatarsals Honeycombing pseudocyst formation and "enlarged nutrient foramens may be seen Subarticular bone destruction (with joint deformity if not splinted) may follow acute lepra reactions Expansion of the cortex with "osteoporosis is rare

Nonspecific periostitis osteitis and osteomyelitis in the anesthetic extremities of leprous patients heal well if abscesses are drained and if treated by rest penicillin and sulfathiazole Trauma to anesthetic joints may cause hematomas infections subluxations and a Charcot like joint.

(6) Helvet. chir acta 22 140-152 April, 1955
(7) J Fac. Radiologists 7 35-56, July 1955



Fig 19 —Hand arteriogram t seven seconds. Constant defects were seen in end loops near areas f bone destruction and old soft tissue infection. Digital artery to thumb show some filling defect possibly due to endarteritis. Note normal vessels in region f area of clearest bone destruction in proximal phalanx of long finger (Courtesy of Paterson, D E. J Fac. Radiologist 7 35-56, July 1955)

the foot of a patient after sensory loss and local nonspecific soft tissue infection (Figs 16-18) Concentric and terminal absorption of phalanges and metatarsals is not neurotrophic and is not inevitably progressive. It can be arrested at any stage by nonspecific treatment and may be arrested without treatment leaving no evidence of inflammatory reaction.

Similar concentric absorptive changes may occur in other conditions without nerve lesions e.g mycetoma malnutrition chronic ulcer and psoriasis Concentric absorption in neural and vascular diseases is perhaps always associated with local trauma hematoma or nonspecific infection or all of them

Serial angiograms of the fingers in leprosy patients show (1) narrowing of the digital arteries where soft tissue has been absorbed but dilatation of digital arteries in local nonspecific infections sometimes with resulting venous engorgement (2) defects in vascular end loops associated with areas of bone absorption (Fig 19) but not in areas of punched-out (specific ?) bone destruction e g the proximal phalanx of the long finger and (3) delay in venous emptying and venous shunts

It is thought that in concentric absorption vascular end loops in soft tissues and periosteum are occluded due to periostitis hematomas or devitalized tissue. Blood supply to the periosteum is therefore affected so that osteoclasts rather than osteoblasts are at work. Vascular end loops and veins draining the medulla may be protected from this process and thus in the medulla compensatory new bone formation can occur

Experimental Study of Reaction of Skeletal Muscle to Injury was carried out on guinea pigs by T J Constance[8] (Univ of Leeds) It was found that skeletal muscle has considerable powers of regeneration but the degree to which this is manifested is limited by proliferating fibroblastic tissue which competes with it The almost complete reconstitution of the muscle which followed crush injuries is attributable to the persistence of a portion of the endomysial and sarcolemmal framework as well as to the disappearance of fibrous tissue Regeneration of muscle fibers however was

(8) Australian J Exper Biol & M Sc 33 257 274 1955

minimal with extensive gap producing injuries The regenerating sprouts showed no evidence of mitotic activity

Histiocytes in the injured muscle play a role in the removal of the necrotic fibers often filling the endomysial tubes In the past they have frequently been mistaken for altered muscle fiber but distinction is possible Fibrous tissue formation is usually abundant after injuries to skeletal muscle but following crush injuries its formation is reversible Surprisingly silica injected into the animal muscle did not lead to fiber formation even after 13 weeks Minimal changes in the muscle fibers of apparently normal muscle not demonstrable with hematoxylin and eosin can be shown with special staining methods such as the periodic acid Schiff reaction They have been observed in the limb muscles of guinea pigs not subjected to any form of experimental injury and also in human adult tongue Repeated crushing of the tongue can produce granular changes in the muscle fibers resembling those of myoblastoma

Myelographic Procedures Results and Risks K Kleinhardt and K Panter[9] consider myelography with methiodal (monoiodomethane sulfonate of sodium) a water soluble iodine compound the method of choice for diagnosis of herniated disks and tumors of the cauda equina The material affords good visualization of all the lumbar region but is not applicable to the thoracic region Accurate localization may be accomplished and the nature of the lesion diagnosed with sufficient accuracy for selection of proper treatment Removal of the material after examination is not necessary since the medium is absorbed in 20-30 minutes Examination may be repeated without risk If precautions are observed complications are rare and clinically insignificant Use of myelography with methiodal is justified in all cases in which an obscure diagnosis of lesions of the lumbar canal is made

Indications for myelography are fundamentally different depending on whether the diagnostic aim is herniated disk or tumor In the latter the disadvantages and risks must be accepted more than in the case of protruded disk which does not have a grave prognosis and is not a menace to life

Myelography with iodized oil is justified in cases of tu

(9) J radiol et electrol 36 159-170 1955

Casts are changed after two months at which time internal rotation is corrected and the hips are placed in midposition as regards rotation Wide abduction is maintained for two more months then the casts are changed and abduction is diminished Immobilization is thus continued for six months The time to discontinue using the plaster cast is determined by the x ray appearance The femoral head should be well seated in the acetabulum and the acetabular roof should be

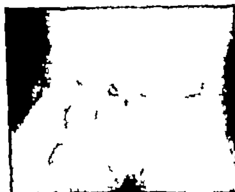




Fig 20 (above left) —Congenital dysplasia of right hip in infant aged 6 months.

Fig. 21 (above) —Immobilization in position of abduction and moderate internal rotation with bilateral long leg plaster supports and crossbar

Fig 22 (left) —After immobilization for four weeks femoral head is well seated in acetabulum and center of ossification has improved.

(Courtesy of McCarroll, H R.: Bull. Hosp. Joint Dis. 15 124-142, October 1954)

well developed After the casts are removed use of a night splint for several months is advisable (Figs 23 and 24) This measure is often continued until age 1 year or until one year after treatment is instituted

In complete dislocation of the hip the primary physical finding is instability of the joint. This is not present in the dysplastic hip and is the most important single point in differentiating the two types of involvement In most instances maximal stability is achieved by flexion abduction and external rotation—the so-called frog position A plaster hip

spica is required for this and is changed every two months The child must be examined frequently and regularly to make sure that the circulation of the extremities remains adequate. After six months use of the hip spica may be discontinued and long leg plasters and a crossbar substituted. Abduction is thus maintained but motion of the hips is permitted in sitting Plaster support is continued for two months then a night splint substituted. This splint may be needed for several months the time required depending on clinical and x ray findings in the individual case With this



Fig 23 (left) —Night splint of Duraluminum, bolted to shoes, used in case of congenital hip dysplasia after complete immobilization has been discontinued in four to six months.
Fig 24 (right) —After two years, hips are symmetrical in appearance. (Courtesy of McCarroll, H. R. Bull. Hosp. Joint Dis. 15 124-142, October 1954)

treatment a satisfactory hip can often be obtained without use of more radical measures

From infancy to walking age the following types of congenital hip dislocation are encountered primary anterior dislocation primary posterior dislocation and simple upward subluxation For primary posterior dislocation McCarroll has routinely applied preliminary skeletal traction This has almost abolished avascular necrosis and secondary degenerative changes encountered when manipulative reduction without preliminary traction was used

TECHNIC.—A wire is inserted in the lower femur and skeletal traction instituted Body weight is used as countertraction and achieved by elevating the foot of the bed. The position of the femoral

head is observed by x ray and the amount of weight required determined by the degree and speed with which the femoral head is brought to a point opposite the acetabulum. Traction is maintained over three weeks, sometimes longer The wire is then removed. Invariably the position of stability is one of abduction and internal rotation The hip is held in this position and a bilateral hip spica applied, extending to the toes on the involved side and to the knee on the opposite side.

If the acetabulum is adequate surgery on the hip can usually be avoided If open reduction is not required the position of abduction and internal rotation is maintained for two months when the plaster spica is removed and a supracondylar osteotomy performed to correct the torsion invariably present. In bilateral involvement treatment of one hip is completed before treatment of the other is instituted

Indications for open reduction in the posterior type of dislocation are presence of an inadequate acetabulum and existence of a fibrous mass within the acetabulum

The various types of treatment used in primary anterior congenital dislocation are traction and closed reduction acetabular reconstruction massive anterior shelf anterior buttress and deepening of the acetabulum Treatment of simple upward subluxation consists of preliminary skeletal traction followed by open reduction and acetabular reconstruction

In patients over age 8 it is usually impossible to produce a perfectly normal hip joint The following palliative procedures are available osteotomy arthrodesis cup arthroplasty and prosthetic arthroplasty

Results of Treatment of Congenital Dislocation of Hip in the Young Child Pierre Bertrand (Paris) and Henri Guias[2] (Pont l Abbe) present evidence to show the value of arthrography in deciding whether to use orthopedic measures or an open operation in treating congenital dislocations of the hip in children under age 5 Diagnostically the malformations visualized by its aid may be classified as dysplasias of the hip partial dislocations dislocations and intermediate forms (Figs 25 29) Displacement of the femoral head in dysplasia is minimal nevertheless there is a slight accumulation of contrast medium inside the cephalic sphere. In partial dis-

(2) Rev chir orthop. 41:56-72 Jan. Mar., 1955







Fig. 25 (above left).—Normal hip.

Fig. 26 (above).—Dysplastic hip.

Fig. 27 (left).—Partial dislocation.

(Courtesy of Bertrand, P., and Gulas, H. Rev. chir. orthop. 41:56-72, Jan.-Mar., 1955.)

locations displacement is much clearer, the accumulation of contrast medium below and inside the head is greater and the head is in contact only with the upper part of the acetabulum Complete dislocation can be identified by the deep notch which separates the cephalic from the acetabular chamber and outlines the upper part of a more or less narrow but always definite isthmus The head is often small This aplasia is especially clear by comparison with the normal

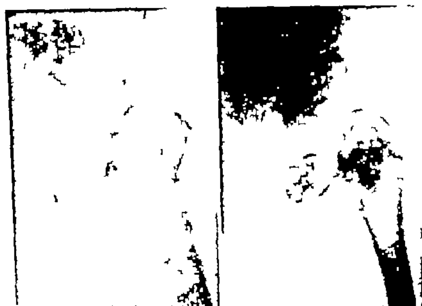


Fig 28 (left) —Intermediate form.
Fig. 29 (right) —True dislocation.
(Courtesy of Bertrand, P., and Gulas, H. Rev chir orthop. 41:56-72 Jan. Mar., 1955)

side in unilateral dislocations A similar notch may be seen in intermediate forms but it is not so deep and the isthmus is wide Successive arthrograms have shown that partial dislocations when untreated may progress until they become complete and irreversible.

The value of arthrography as a guide during treatment is equal to its usefulness in diagnosis If an arthrogram made after an attempt at reduction shows that success has been achieved orthopedic treatment may be instituted if reduction has failed an open operation should be performed either at once or when the child is age 2½ Between these two

extremes there are certain borderline cases in which reduction, though not bad is imperfect. Some of these may respond to orthopedic treatment but the proportion of failures with such treatment has been so large that the authors now operate in most doubtful cases

Analysis of results of treatment in two series (298 children 551 hips 312 children 426 hips) showed that closed reduc-



Fig 30 —Bilateral dislocation. (Courtesy of Bertrand, P., and Gruss, H. Rev chir orthop. 41 56-72 Jan. Ma 1955)

tion rarely succeeds in true dislocations and that in these cases open reduction is more often indicated Results obtained by operative treatment in a child 2½ with bilateral dislocation are shown in Figures 30-32 Partial dislocations, on the contrary often respond to orthopedic measures the younger the child, the better the response. Although the high proportion (80%) of satisfactory results in these cases shows the value of the authors method, they believe that even greater success can be achieved by earlier treatment and improvements in technic

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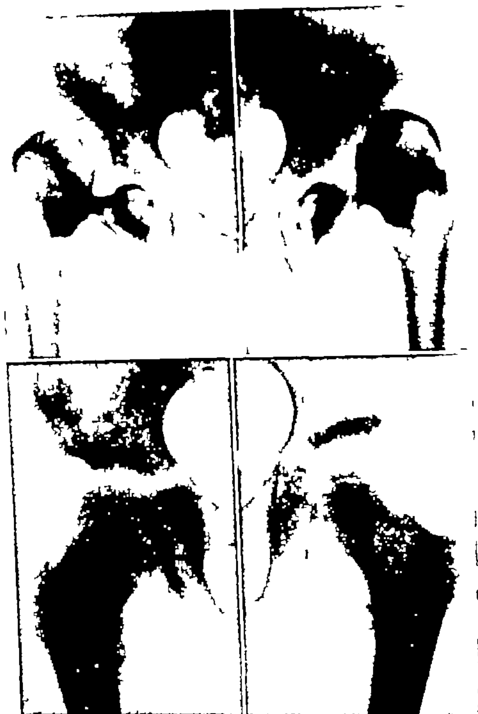


Fig. 31 (top) —Arthrogram before reduction showing narrow isthmus.
Fig. 32 (bottom) —Late result after open bilateral reduction.
(Courtesy of Bertrand, P., and Golan, H. Rev. chir. orthop. 41:56-72 Jan.-Mar., 1955.)

Early Weight Bearing and Correction of Anteversion in Treatment of Congenital Dislocation of Hip E. George Chuinard[3] (Shriners Hosp for Crippled Children, Portland, Ore) used the following routine treatment for congenital dislocation of the hip skeletal traction before reduction, walking peg to permit weight bearing in the cast, and correction of anteversion by subtrochanteric osteotomy The routine is applicable mainly to children aged 18 months to 8 years Anteversion should be corrected before turndown shelf operation or intra-articular procedures are done. Its correction by osteotomy decreases necessity for open reduction.

No specific degree of anteversion can be accepted as definite indication for derotation osteotomy in all ages The younger the child the more likely that natural growth processes will correct anteversion but any doubt should be resolved in favor of osteotomy In the author's opinion *30* degrees of anteversion is indication for derotation osteotomy He believes that the subtrochanteric area is the proper site for derotation osteotomy The walking-cast used after reduction did not appear to increase incidence of aseptic necrosis of the femoral head.

Open Reduction of Congenital Dislocation of Hip Joint Anatomic, Clinical and Radiographic Studies. It is generally acknowledged that closed reduction is not a sufficiently reliable method of treating congenital dislocation of the hip Sometimes reduction is difficult to bring about and sometimes it fails despite energetic attempts Furthermore, even if an acceptable position is achieved there is considerable risk of both redislocation and subluxation later

Carl Hirsch[4] (Karolinska Inst. Stockholm) performed open reduction by the posterior approach on 13 hips after closed reduction had failed In all the limbus was dislocated into the acetabulum (Fig 33) Often the acetabulum was also more or less covered by the capsule attached to the acetabular rims Reduction was easily achieved after a combined capsule limbus excision The most stable position of the femoral head was obtained with the leg fixed in 60 degrees abduction and 60 degrees flexion Immobilization in plaster

(3) J Bone & Joint Surg 37 A 229-245 April, 1955
(4) Acta orthop. scandinav 24 300-309 1955



Fig. 33 (Courtesy of Carl Hirsch.)

was restricted to only two or three weeks Despite good primary function x ray changes highly reminiscent of osteoarthritis deformans juvenilis developed in the femoral head during one year

Indications for Acetabular Roof Plastic Procedure in So-called Congenital Dislocation of Hip K Worzfeld[5] (Würzburg) reports 140 operations done on 110 patients between 1947 and 1953 37 patients with congenital dislocation of the hip were examined three to six years after operation

After conservative reduction of hip dislocation the operation is indicated if there is no bony apposition. Results in such cases are always good both functionally and roentgenologically the head of the femur is always in good position. In subluxation after incomplete reduction or in untreated congenital dislocation of the hip the operation is indicated only if there is no fibrous tissue in the acetabulum The fibrous tissue can be demonstrated by injecting contrast material into the joint and taking x rays If fibrous tissue is

(5) Arch. orthop. u. Unfall-Chir 47:412-416, 1955

Early Weight Bearing and Correction of Anteversion in Treatment of Congenital Dislocation of Hip E George Chuinard[3] (Shriners Hosp for Crippled Children Portland, Ore.) used the following routine treatment for congenital dislocation of the hip skeletal traction before reduction, walking peg to permit weight bearing in the cast, and correction of anteversion by subtrochanteric osteotomy The routine is applicable mainly to children aged 18 months to 8 years Anteversion should be corrected before turndown shelf operation or intra articular procedures are done. Its correction by osteotomy decreases necessity for open reduction

No specific degree of anteversion can be accepted as definite indication for derotation osteotomy in all ages The *younger the child the more likely that natural growth processes* will correct anteversion but any doubt should be resolved in favor of osteotomy In the author s opinion, 30 degrees of anteversion is indication for derotation osteotomy He believes that the subtrochanteric area is the proper site for derotation osteotomy The walking cast used after reduction did not appear to increase incidence of aseptic necrosis of the femoral head

Open Reduction of Congenital Dislocation of Hip Joint Anatomic Clinical and Radiographic Studies It is generally acknowledged that closed reduction is not a sufficiently reliable method of treating congenital dislocation of the hip Sometimes reduction is difficult to bring about and sometimes it fails despite energetic attempts Furthermore even if an acceptable position is achieved there is considerable risk of both redislocation and subluxation later

Carl Hirsch[4] (Karolinska Inst Stockholm) performed open reduction by the posterior approach on 13 hips after closed reduction had failed In all the limbus was dislocated into the acetabulum (Fig 33) Often the acetabulum was also more or less covered by the capsule attached to the acetabular rims Reduction was easily achieved after a combined capsule limbus excision The most stable position of the femoral head was obtained with the leg fixed in 60 degrees abduction and 60 degrees flexion Immobilization in plaster

(3) J Bone & Joint Surg 37 A.229-245 April, 1955
(4) Acta orthop scandinav 24.300-309 1955



Fig 33 (Court y (C d H wk)

was restricted to only two or three weeks Despite good primary function x ray changes highly reminiscent of osteoarthritis deformans juvenilis developed in the femoral head during one year

Indications for Acetabular Roof Plastic Procedure in So-called Congenital Dislocation of Hip K Worzfeld[3] (Wurzburg) reports 140 operations done on 110 patients between 1947 and 1953 37 patients with congenital dislocation of the hip were examined three to six years after operation

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Fig 33 (Cont.) (Case II ...)

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present, the operation results in a lesion of the head of the femur or of the bone graft The fibrous tissue in the acetabulum should be removed before the acetabular roof graft is inserted.

Increase of the angle between the neck and shaft of the femur is not an indication for this procedure In such cases, acetabular roof graft is seldom necessary following osteotomy to correct improper angulation

The bone used for the operation is the acetabular roof it self separated and folded down parallel to the surface of the head of the femur and fixed by one or more grafts connected to the ileum

Results of Treatment of Congenital Dislocation of Hip before 5 Years of Age are presented by Michel Salmon.[6] Owing to dispersal of records during the war and incomplete follow up as a result of parental indifference no statistical presentation of results is given

The question of treatment of congenital dislocation is most controversial results are contradictory and series of cases are not actually comparable Experience varies from one year to another On the basis of 20 years experience with 400 nonoperative and 80 operative cases (simple arthroplasties Colonna operations extracapsular arthroplasties) several points require emphasis Arthrography the technic of treatment and the indications are all elements which influence results

Treatment before age 15 months is orthopedic without preceding arthrography Arthrography is indispensable as an aid to management between age 15 months and 4-5 years If there is a large isthmus treatment is nonoperative If the isthmus is intermediate orthopedic treatment is attempted in event of failure it will frequently be partial (residual subluxation) In case the isthmus is narrow and the dislocation not reducible treatment is operative. Choice of procedure is subtle. Generally if the femoral head is low simple arthroplasty is the choice if the head is high a Colonna procedure. After age 4 arthrography is almost useless If displacement is slight (subluxation) orthopedic reduction is attempted quite often an abutment procedure (extracapsular arthro-

(6) Rev chir orthop 41 191 202, Apr June, 1955

entities based on clinical differences and differences in deformity produced

Symptomatology is not a good basis for differentiation because the patient's complaints change with progression of the disease. Measurements of the angles of resultant deformity over a six year period in patients with all stages of hip joint dislocation were studied The measurements were made by fluoroscopy of the supine patient some were confirmed at operation Seventeen cases of subluxation and 25 cases of luxation form the basis of this report The average of the antetorsion angle in subluxation was 31 and in luxation 44 Four children with subluxation on one side and luxation of the opposite hip joint are also presented There was little or no difference in the angles on the affected sides

These findings tend to support the argument that there is gradual differentiation of a single disease process and that subluxation is the first stage of luxation

Congenital, Habitual Prefemoral Subluxation of the Knee is relatively rare, according to H R. Mattner[9] (Univ of Leipzig) About 130 cases have been reported so far In most instances it is directed anteriorly (prefemoral) but it may be lateral or posterior Though mostly unintentional it may be produced voluntarily Furthermore there are patients in whom subluxation occurs both ways as in the following case.

Baby girl 9 days old, born at term, had limited extension of both elbows. She also had clubfoot bilaterally and limited abduction in the hip joints Both knees were kept in contraction and were of normal shape in this position. On active as well as passive extension, prefemoral subluxation developed bilaterally accompanied by a loud noise. From this position the baby was able to bend her knees and with a loud click the subluxation corrected itself

At the age of 1 year the right knee was visualized with liquid and gaseous contrast mediums, and the x ray picture of the knee in extension revealed both articular surfaces widely separated. The proximal end of the tibia appeared to be normally developed and the distal cartilaginous femoral end slightly flattened (Figs. 34 and 35)

Factors favoring development of congenital habitual subluxation of the knee include changes in cartilaginous or bony joint surfaces excessive widening of the posterior part of the joint capsule and a major relaxation or complete absence of

(9) Arch orthop. u. Unfall-Chir 47 664-675 1955



Fig. 34 (left) Exten ion of knee joint with subluxation of t bia anteriorly Flat tening of anterior part of femoral condyles with normal, flat tibial articular surface Fibular head i displaced relatively far dorsally

Fig. 35 (right) —On flexion, ticula surfaces show normal relation.

(Courtesy of Mattner H R. Arch. orthop. u. Unfall-Chir 47 664-675 1955.)

the cruciate ligaments The etiology is controversial Whereas some authors blame intrauterine mechanical factors others stress primary germinative developmental defects

Congenital Dislocation of Knee In this rare but important congenital deformity the child is born with one or both knees in hyperextension It may even be possible to approximate the leg to the anterior surface of the thigh. The proximal end of the tibia is displaced anteriorly and laterally on the femur and there may be overriding of the joint Pathologically there is usually shortening of the quadriceps tendon and the iliotibial band The patella is generally not palpable but readily begins to form after correction of the deformity The anterior half of the capsule is contracted but the pos

entities based on clinical differences and differences in deformity produced

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terior portion, with the anterior cruciate ligament is necessarily lax There may be abnormalities of articular surfaces of tibia and femur due to abnormal positions Two types are generally differentiated the more common traumatic developmental type considered due to malposition in utero and that due to primary embryonic defect accompanied by other defects such as cleft palate harelip cardiac lesions spina bifida, dysplasia of the hip or clubfoot

Management consists of early manipulation usually performed gradually in stages with metal splints or casts to

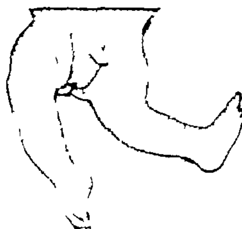


Fig 36.—Hyperextension and external rotation of left knee. (Courtesy of Chy-bu gh, B J and Henderson E. D Proc. Staff Meet. Mayo Clin 30:396-400, Sept. 7 1955.)

hold the reduction The casts are changed or splints bent to allow gradual flexion of the knees Trauma to the epiphyses is not uncommon because of the forces required but adverse effects have not been noted Subcutaneous tenotomy of the iliotibial band is often necessary to maintain reduction and braces may have to be used The surgical corrections necessary in the more difficult cases of the type attributable to primary embryonic defect and in cases of the developmental type seen too late for conservative therapy are varied Tight, contracted structures such as the quadriceps tendon iliotibial band anterior half of the capsule or posterior cruciate ligament can be lengthened or sectioned. Relaxed structures such as the posterior capsule or anterior cruciate ligament,

can be reefed A supracondylar wedge osteotomy may have to be done in the late cases to correct anteversion of the femoral epiphysis and the tibial articular surfaces can be reshaped Outward displacement of the gastrocnemius may be corrected by anchoring the muscle to the femur above the condyles This muscle, when functioning in its normal position helps to prevent hyperextension

To illustrate the importance of early recognition and early institution of conservative treatment of this abnormality Bennie J Clayburgh and Edward D Henderson[1] report the second case of congenital dislocation of the knee seen at Mayo Clinic (Fig 36)

In a child, aged 3 months the knee was manipulated and the anterior dislocation partially reduced. The leg was placed in a long leg cast with the knee flexed 10 degrees. The procedure was repeated a few days later and increased reduction obtained. Then the cast was changed twice weekly without anesthesia for six weeks Sixteen months later the knee was stable and could be flexed from 180 to 90 degrees but some genu valgum and mild anterior bowing of the tibia was present.

Arthrogryposis Multiplex Congenita Review of 54 Cases is presented by J Hiram Kite[2] (Atlanta Ga) This is a rare condition with congenital limitation of motion in several joints accompanied by one or more congenital deformities Average incidence was one arthrogrypotic born every 8 months for 30 years but in 1954 six were born between January 20 and March 4 (Fig 37) Of the 54 patients studied 34 (63%) were boys Clubfoot, present in 42 (76%) was bilateral in 32 Shoulders were involved in 22 and elbows in 29 The wrist was flexed in 31 and hyperextended in 3 The fingers showed many variations in limitation of motion of various joints Dislocation of the hip was present in 23 of 31 with no dislocation 16 showed marked limitation of motion with fixation in flexion and outward rotation Motion was limited in the knees in 43 in 29 the knees were flexed and could not be extended the patellas were dislocated in 5 Nine had a severe bilateral flatfoot deformity and six had metatarsus varus only four had normal feet.

In favor of genetic etiology were three arthrogrypotics

(1) Proc. Staff Meet., Mayo Clin. 30:396-400 Sept. 7 1955
(2) South M. J 48 1141 1146, November 1955

(two mothers and one father) with arthrogrypotic children. Six (11%) had ancestors with deformities In one family, two arthrogrypotic children were born to parents who were first cousins with no familial history of deformities on either side. In apparent contradiction of the genetic theory were



Fig 37 —Typical arthrogrypotic—one of six born within six weeks. (Courtesy of Kite, J H. South. M. J 48 1141 1146, November 1955)

three sets of twins (one set identical) with one twin in each set normal and one arthrogrypotic

One third of the arthrogrypotics were first-born children 10 were premature 26 were born at term and in 18 there was no record. Weight was under 7 lb in 19 Many mothers volunteered information that fetal movement was slight toward end of pregnancy

Limitation of motion in the joints makes this one of the most discouraging and difficult of all congenital deformities to treat. Patients with milder cases learn to walk and to take care of themselves but those more severely afflicted with all four extremities involved can walk only after several operations and then only with braces and crutches.

Arthrogryposis Multiplex Congenita. This entity is present at birth and is recognizable by the presence of flexion and/or extension contractures of a few or many of the joints of the extremities. Either a single limb or all four are involved. The disease is generally symmetrical and probably results from incomplete development or failure of development of one or more muscle groups during intrauterine life. Generally the affected limbs are small in circumference and the joints are unusually large. Muscle weakness and hypotonia are prominent features in most instances. As a rule tendon reflexes cannot be obtained. Luxations and subluxations of many joints may occur. Associated anomalies include webbed fingers, polydactylia, hydrocephalus and other malformations of the skull, absence of the sacrum and of the patella, clubfeet, clubhands and acetabular dysplasia.

Harold G. Jacobson, Earle A. Herbert and Maxwell H. Poppel[3] (New York) report on seven boys and six girls with arthrogryposis multiplex congenita since birth. Delivery of six was abnormal. Muscle bundle atrophy, osteoporosis and flexion or extension contractures or both occurred in all patients and congenital hip dislocation in seven. The flexion and extension contractures occurred in varying degrees, with an average of almost five joints per infant involved. The contractures were most common in the knees, hips and elbows.

Biopsy of a muscle specimen of one patient showed hyaline necrosis, atrophy and fat replacement in some areas. Some of the muscle fibers had well preserved long and cross-striations with the fibers several times smaller than usual. One bone biopsy showed well preserved normal compact bone, whereas another biopsy of a tarsal bone from the same patient three years later revealed aplastic bone with retardation of ossification of the cartilaginous portion. Addition-

(3) Radiology 65:8-18, July 1955

ally there were islands of unossified cartilage representing imperfect ossification of the spongy bone

Ehlers Danlos Syndrome with Ectopic Bone Formation is reported by Isadore Katz and Karl Steiner[4] (V.A Hosp., Brooklyn) This condition consists of a complex of genetic abnormalities affecting the skin and its blood vessels joints and subcutaneous tissues The skin can be raised in high folds which when released retract spontaneously and more

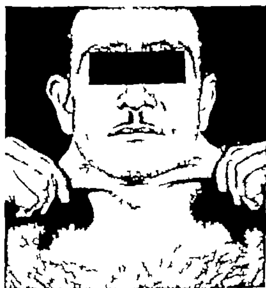


Fig 38.— Hyperelasticity of skin of neck. (Courtesy of Katz, I and Steiner K.: Radiology 65 352 360 September 1955)

or less completely There is passive and active hypermobility of joints particularly of fingers and toes Fragility and friability of the skin and its blood vessels are responsible for hematomas following minor trauma Trivial injuries also produce gaping skin wounds which heal with difficulty leaving irregular scars Small cystlike movable subcutaneous nodules are often seen Occasionally a patient may have one or more associated abnormalities e g clubfoot dental deformities lymphangiectatic tumors acrocyanosis and mental deficiency The most suggestive radiologic finding is perhaps subcutaneous calcified nodules They are widely distributed but confined to the extremities lie immediately

(4) Radiology 65 352 360 September 1955



Fig 39 (top) —Original x ray appearance of para-articular ectopic bone "bridges" from anteroinferior iliac spines to greater trochanter
Fig 40 (bottom) —X-ray appearance 10 years later
(Courtesy of Katz, I., and Steiner K. Radiology 65 352-360 September 1955)

beneath the skin and are most numerous in the lower two thirds of the legs Individual calcifications are almost invariably ovoid 4-8 mm in size and are homogeneously dense bordered by a sharply defined peripheral zone of denser calcification like a shell or the cortex of a small bony body

In a man, 38 diagnosis of Ehlers-Danlos syndrome was based on hyperelasticity of the skin (Fig 38) hypermobility

of joints abnormal formation of hematomas and x ray evidence of disseminated calcified subcutaneous nodules A previously unreported finding was large masses of mature ectopic bone in the hip muscles bilaterally (Fig 39) The mass on the left was excised from its bed in the tendon and muscle fibers of the rectus femoris Histologically and radiographically, the specimen revealed mature bone with compact cortical and internal spongiosal layers Pathologic diagnosis was metaplastic ossification Ten years later (Fig 40) there was a large cauliflower like calcified mass arising from the original surgical site at the anterior inferior iliac spine, which had appeared within five months after operation The right hip which had not been operated on remained unchanged during the 10 year period. Special stains of skin sections suggested hypertrophic changes of elastic tissue and showed some increase in mucopolysaccharides of the ground substance

Uncommon Familial Systemic Disease of Skeleton Hyperostosis **Corticalis Generalisata Familiaris** in a twin brother and sister is reported by F S P van Buchem H N Hadders and R Ubbens[5] (Groningen Netherlands) Both had

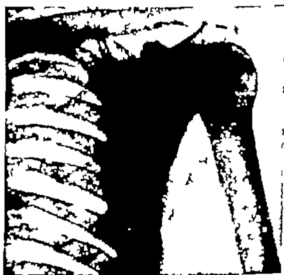


Fig 41—Thickened and sclerotic bone structure in clavicle, ribs and humerus (Courtesy of van Buchem, F S. P et al Acta radiol. 44 109-120, August, 1955.)

(5) Acta radiol. 44 109-120 August, 1955

normal appearance at age 10 Skeletal changes progressed gradually thereafter and by age 20 the chins were markedly enlarged Both showed increasing mental deterioration visual and hearing loss and speech difficulties as bone changes progressed The changes consisted mainly of marked cortical hyperplasia with extensive osteophyte formation Size of the bones was increased the marrow cavity was reduced and



Fig. 42.—Thickened and sclerotic skull cap. Enlarged and sclerotic mandible. (Courtesy of van Buchem, F S. P., *et al* Acta radiol. 44 109-1 0 August, 1955)

the cortex thickened (Figs 41-44) with thickening chiefly localized to the diaphyses of long bones metacarpals metatarsals and phalanges Spongy bone showed ordinary structure. Serum calcium and inorganic phosphate levels were normal and alkaline phosphate level was slightly increased The blood picture was normal

At autopsy the internal organs of the woman at age 52 appeared normal Though the pituitary gland appeared reduced to a vesicle the wall of which contained no adenohypophysial elements but only glia tissue and a few mononu



Fig 43 (left)—Thickened metatarsal bones with periosteal crests.
Fig 44 (right)—Thickened metacarpal bones with periosteal crests.
(Courtesy of van Bochem, F S. P., *et al.* Acta radiol. 44 109-120 August, 1955)

clear lymphocyte like cells other endocrine glands were normal. Endocrine disorders were also absent clinically As other family members were healthy the condition may have been due to germinal damage in utero

The cases somewhat resemble those of Camurati Engelmann disease but skull changes in the former were less conspicuous and spindle-like thickening of long bones and marrow fibrosis were present Onset at early age was another distinctive feature

Acromial Apophysitis an Infrequent Site of Osteochondropathy F K Landgraf[6] (Frankfurt) reports a case of bilateral acromial apophysitis in a boy 16 who complained of pain in both shoulders especially after heavy work An x ray demonstrated small segmented acromial epiphyses with irregular borders (Fig 45) Six weeks later (the patient did not



Fig. 45 (Courtesy of Landgraf F K. Fortschr Geb. Rontgenstrahlen 81 797 800 December 1954)

work during this time) the pain was gone and both epiphyses showed improvement on x ray study

Only one other case with this x ray appearance has been reported and in it there were no symptoms Whether this change represents a normal stage of development or aseptic necrosis is difficult to determine Serial roentgen changes associated with other clinical symptoms might be correctly called aseptic necrosis

Clinical Significance of Classification of Epiphysial Injuries at the Ankle. Charles O Carothers and Andrew H Crenshaw[7] (Memphis Tenn) reviewed 54 cases of epiphysial

(6) Fortschr Geb. Röntgenstrahlen 81 797-800 December 1954
(7) Am. J Surg. 89:879-889 April, 1955.

injuries at the ankle 33 of which were followed up T juries included 20 with lateral displacement of the dista al and fibular epiphyses (abduction type) 20 showin terior displacement of the tibial epiphysis including external rotation type 6 caused by forcible plantar f

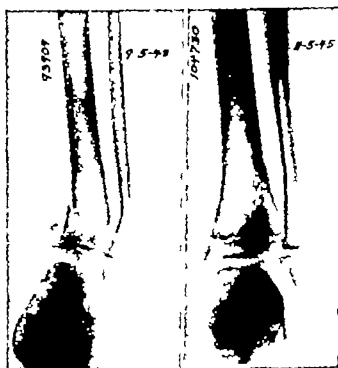


Fig 46 (left) —Adduction fracture separations of distal tibial epiphysl degree type showing entire tibial epiphysis displaced but with medial metaphysl through epiphysis like an ax.
Fig. 47 (right) —Second degree type, showing medial malleolus separat fracture through the epiphysis itself.
(Courtesy of Carothers, C. O and Crenshaw A. H. Am. J Surg 89 April, 1955)

and 3 due to axial compression or direct violence 14 in had varying degrees of medial displacement classified duction injuries Of the last, two involved the entire epiphysis as a unit (third degree) four involved fr through the tibial epiphysis (second degree) and eig volved merely minimal medial displacement of the t epiphysis (first degree) (Figs 46 and 47)

Accurate reposition of the displaced epiphyses at th pense of forced or repeated manipulation or operative vention is not indicated as spontaneous realinement c

ankle occurs even late in the growing period The authors found that deformity at the ankle can be predicted at the time of injury, because it usually occurs in the adduction group and x rays demonstrate a disruption of the epiphysis itself Second and third degree adduction type epiphyseal

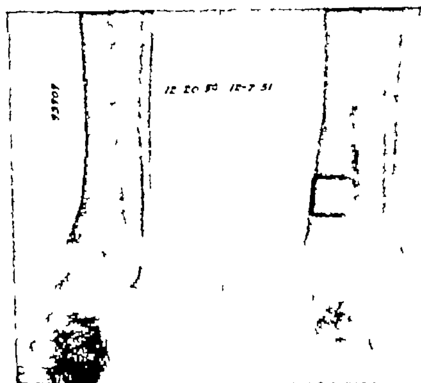


Fig 48 (left) —Fracture separation three years later demonstrating varus tilt of ankle mortise due to premature closure of tibial epiphysis medially
Fig 49 (right) —After open wedge osteotomy without lateral epiphysiodesis.
(Courtesy of Carothers, C O., and Crenshaw A. H. Am. J Surg. 89:879-889 April, 1955.)

fracture separations play a significant role in deformities around the ankle This is well demonstrated in Figures 48 and 49

The authors found no evidence that massive displacement of the epiphyses results in clinically discernible disturbance of growth or in subsequent defects in ossification of the adjacent metaphysis

Secondary Deformities Following Epiphysial Separations and Fractures Near the Epiphysial Line are reported by A Lehner and J Dubas[8] (Lucerne) Epiphysial separations

(8) Helvet. chir acta 21 388-410 December 1954

Changes were almost regularly produced in the head and neck of the femur and in the acetabulum In about 60% of patients the head assumed an anatomically disadvantageous mushroom like or angular shape The angle between the shaft and neck of the femur varied but often there was considerable functional coxa vara. The acetabulum usually adjusted itself to conform with the deformity of the femoral head Hip joint mobility was reduced as a result of original deformities and changes due to secondary arthrosis deformans Restriction of motion usually reduced rotation and abduction was observed in nearly all patients One third complained of pain after heavy manual work, and six (18%) reported reduced capacity to do any manual work

There was little difference in results in patients treated with less than four months of bed rest and in those treated with four months or more of bed rest.

Metaphysial Dysplasia, Epiphysial Dysplasia, Diaphysial Dysplasia and Related Conditions III Progressive Diaphysial Dysplasia is diagnosed according to W P U Jackson Joseph Hanelin and Fuller Albright[2] (Harvard Med. School) during the first decade on the basis of roentgenographic changes in the long bones In the early stages symmetrical fusiform expansion occurs at the midshafts. Sometimes two separate diaphysial foci of bone expansion are seen in the femora or in the tibiae with the intervening shaft less intensely involved or almost totally spared. The outlines of the abnormal sections are usually smooth but the *bone pattern is amorphous in texture and of irregular density* with consequent loss of normal trabecular structure and frequent effacement of cortical and cancellous differentiation (Fig 54) The new bone is both endosteal and periosteal. The skull often shows increased density and thickening at the base or in the vault The clavicle may also be involved. In one of the authors patients a metacarpal bone was also affected. The condition is progressive with spread of the osseous changes proximally and distally in each long bone to *involve almost all of the diaphysis The epiphyses are uniformly spared* Epiphysial development and bone age remain normal There are no biochemical abnormalities

(2) A.M.A Arch. Int Med. 94 902 910, December 1954



Fig 54.—Anteroposterior view of femora of girl, 4 Note lateral bowing distal to midshaft, widening of midshafts, increased density and amorphous bone. (Courtesy of Jackson, W P U et al. A.M.A. Arch. Int Med. 94:902-910 December 1954)

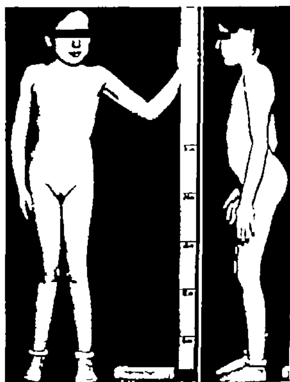


Fig 55 —Girl, aged 9 with poor muscular development, postural lordosis and genu valgum. (Courtesy of Jackson, W P U., et al: A.M.A. Arch. Int. Med. 94:903-910, December 1954)

Clinically the patients appear weak and thin and are shorter than normal (Fig 55) Their muscular development is poor their gait waddling Some complain of pain in the legs

The authors have been able to follow two patients One showed comparatively little progression over five years while the other had severer bone changes than had ever been reported previously

POLIOMYELITIS

Evaluation of Importance of Symptoms Signs and Spinal Fluid Findings in Diagnosis of Poliomyelitis in Absence of Paralysis is discussed by J B R. Cosgrove[3] (Univ of Manitoba) During an epidemic of acute anterior poliomyelitis all patients who were referred because of the suspicion that they were suffering from poliomyelitis but who had no paralysis were divided into two groups on the basis of the spinal fluid findings The first group consisted of 100 patients who showed abnormal changes in the cerebrospinal fluid the second comprised 115 patients with normal cerebrospinal fluid A follow up study was made to determine how many of the patients developed paralysis later

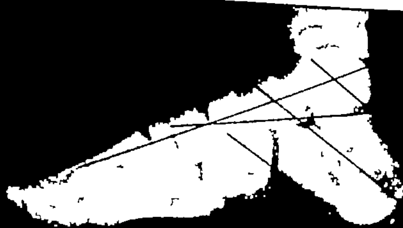
It was found that the following physical signs during the epidemic were significant even when there was no evidence of paralysis neck rigidity back rigidity Kernig s sign Brudzinski s sign and muscle tenderness When the cerebrospinal fluid was normal in a patient with these signs there was less than a 3% chance that he had the disease. Thirty of 76 followed in the abnormal group and 2 of 88 in the normal group subsequently developed paralysis

Cerebrospinal fluid examination of patients presenting with meningism but without paralysis and with evidence of an increase in white cell count and protein content will confirm the clinical diagnosis In this study 6% of the patients with abnormal cerebrospinal fluid had no signs except fever In such cases clinical diagnosis will be missed unless the cerebrospinal fluid is examined

Development of Calcaneal Foot Deformity after Poliomyelitis Th. Rosendal[5] (Copenhagen) reviews the x ray findings in 167 feet of patients with paralysis of the triceps and in most cases of one or more other muscles of the lower leg and foot

The deformity is caused by a change in the shape and position combined or separate of the calcaneus The change

(3) Canad. M. A. J 72.808-811 June 1 1955.
(5) Acta orthop. scandinav 24.216-249 1955



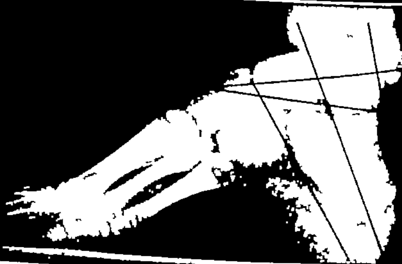


Fig 56 (top) —Normal foot (left) calcaneal articula plane angle 6 degrees
Böhler angle 43 degrees calcaneal plantar surface angle, 33 degrees; talus angle,
22 degrees.

Fig 57 (bottom) —Calcaneal foot (right) with elevation of anterior end of calcaneus
and atrophy of calcaneal tubercle anteroplanta aspect calcaneal articular plane
angle, —3 degrees Böhler angle, 70 degrees; calcaneal plantar surface angle 55
— 9 = 46 degrees talus angle, 8 degrees

(Courtesy of Rosendal, Th. Acta orthop. scandinav 24.216-249 1955)

consists of atrophy of the tuber calcanei the plantar prominence of the posterior calcaneal process and anteroplantar atrophy of the calcaneus The change of position appears as an elevation of the anterior end of the calcaneus (Figs 56-57), sometimes combined with the posterior part of the foot in the valgus position and in pronounced cases accompanied by dorsal flexion of the talus

The close connection between the various combinations of paralysis and the development of the calcaneal foot indicates that the course can be determined early Important prognostic factors are the time of onset of the disease and the development of contractures Treatment is important for the most pronounced degrees of the deformity were found among the cases that had not been treated

With physical therapy in which the foot is kept soft and the muscles exercised it is scarcely possible to avoid atrophy of the calcaneal tubercle. In the brace treatment the foot must be placed in the neutral position Early operative treatment is indicated when physical treatment and bracing prove to be insufficient for keeping the foot in the normal position

Neuro-orthopedic Studies on Paralysis of Quadriceps in Poliomyelitis J Canadell Carafi and L. Barraquer-Bordas[4] (Barcelona) stress the importance of myoplastic procedures designed to provide the fullest possible functional compensation for a paralyzed femoral quadriceps in patients with paralytic sequelae of acute anterior poliomyelitis They reject the belief that the automatism of walking invalidates any attempt at functional restoration by transplantation of quadriceps antagonists This position is supported by results in 58 patients Neurophysiologic and electromyographic studies show that the so-called automatism of walking far from being rigid is built up under cortical control and is always subject to the capacity for adaptation proper to that control By a process of active readaptation or re-education new muscular associations constituting a new and efficient though more difficult, automatism can be established.

The ideal surgical procedure is one that utilizes the biceps the semitendinosus and the tensor of the fascia lata. The reconstruction carried out with their aid closely resembles

(4) Rev neurol. 91 200-226, 1954

the quadriceps with the fascia lata representing as ful possible the rectus anterior and the two other transpl muscles taking the place of the two vasti Other mu may, however be used if necessary Preoperatively, the cles to be transplanted should be evaluated by muscle te and electromyography in general muscles with str below the third degree (International scale) are unfavo Visual surgical exploration at operation not only hel confirm the data obtained but also makes it possible t termine which muscles are best preserved and therefore utilizable The operation must be performed under asepsis with a nontouch technic A tourniquet shou used to insure a bloodless field and thus shorten the p dure. When the muscle selected for transplantation has carefully dissected with respect for its irrigation and i vation it is passed to its new point of insertion throug fatty tissue. This reduces the possibility of adhesions t minimum but care must be used to prevent angulatio soon as a certain physiologic tension has been establ in the transplanted muscle it is solidly fixed to the pa with stainless steel wire and the wound closed The kn then immobilized in extension for three weeks during w the hip must not be bent

Success or failure depends on proper re-education w should be begun as soon as the surgical insertion is st enough to withstand voluntary contractions often w three or four weeks after operation The patient is first ta to practice selective contraction of the transplanted mus When this ability has been acquired he is given strengt ing exercises and encouraged to walk

Results have always been excellent when the three mu ideally needed have been available with a strength o tween 4 and 5 (International scale) 72 6% of the 58 pati were in this category Good results with acceptable func al capacity for walking were obtained in the other 27 whose muscle strength was below this rating

Use of Pathologic and Unlocking Reflexes in Rehabi tion of Spastica. Temple Fay[6] (Philadelphia) points out there are various ways of making the muscles work

(6) Am J Phys Med 33 347 352, December 1954

when the brain levels above the crus have been destroyed or impaired In addition for practical therapy there are certain made to order exercises, in the form of normal and pathologic responses that follow the pattern in which the spinal cord and muscles most easily function

In the spastic forms of paralysis the simple reflexes may be activated and by repeating either the deep or superficial stimuli a single muscle or a group of muscles may be made to respond indefinitely or to the state of fatigue If there is no joint fixation or tendon muscle contracture and the reflex arcs below the pons are intact the therapist should have a "field day simply scratching and tapping the patient (in the prone position) with appropriate nontraumatizing equipment and letting nature take its course or letting the patient do what comes naturally

These built in exercises can easily be worked out for any portion of the body with a few mechanical aids Besides using all the popular "normal deep tendon reflexes as individual muscle exercisers groups of muscles can be aroused and co-ordinated by the technics that provoke the ' pathologic responses such as the Hoffmann and Babinski signs ankle clonus and other defense" or spinal mass reflexes

By inducing once or twice daily 12 20 of these reactions in succession not only does the spastic muscle function improve but its volume increases in a few weeks and the response begins automatically to integrate into a wider and better organized pattern with striking diminution in the spastic tone and postural disturbance of the part.

Feeding walking and certain self-care responses can be obtained through conditioning" even for profoundly involved patients when reflex patterns are used as the base for activating otherwise paralyzed and spastic musculature.

The benefits to posture muscle tone and functional activity depend on the training and utilization of the improved state of spasticity and muscle response, and on appropriate measures of physical therapy and patterns of movement which will lead to better rehabilitational accomplishments

Gelatin Sponge as Filling in Infected Bone Cavities Treatment and Results in Chronic Osteomyelitis Lars Hagelstam[7] (Helsinki) tested gelatin sponge as filling substance in 23 cases of chronic osteomyelitis i e hematogenous osteomyelitis or osteitis caused by open fractures or other accidental bone lesions After sequestra necrotic bone and granulation tissue were removed the cavity was powdered with streptomycin and filled with gelatin sponge soaked in a penicillin solution Penicillin was given systemically

The lesion healed by primary intention in 15 cases in only 1 of which the disease recurred. Suppuration of the wound appeared in eight continuing a long time. Both primary and late results in these cases were bad. Remaining diseased bone or inaccessible foci were usually the cause of failure radical saucerization gave good results In one case, it was proved at a later operation that the gelatin sponge was replaced by fibrous connective tissue The bone cavity filled in many cases partly through concentric bone formation developing from the walls of the cavity In two cases, x ray examination demonstrated ossification of the substance in the cavity itself

Gelatin sponge has thus been proved useful for filling infected bone cavities A good result can be expected if the bone is chiseled radically even if the cavity subsequently becomes large

Complications of "Osteitis Pubis," Including Report of Case of Sequestrum Formation Giving Rise to Persistent Purulent Urethritis B D Stutter[8] calls attention to the lack of understanding of the exact cause of osteitis pubis the confusing nomenclature and consequently the difficulties with regard to treatment The main complications are pain and prolonged disability Sequestrum formation has not previously been reported

Man, 62, had symptoms of bladder neck obstruction due to prostatic

(7) Acta chir scandinav 108 283-300 1954.
(8) Brit J Surg 42 164-172 September 1954

enlargement. Retropubic prostatectomy was performed. Eight weeks later symptoms and signs of osteitis pubis appeared. An abnormally wide gap between the pubic bones on x ray suggested osteitis pubis. The condition appeared to resolve eight months after prostatectomy. However 11 months after operation, the patient complained of dysuria of one month's duration. He was found to have a purulent urethritis and left sided epididymitis. After an initial response to antibiotics and chemotherapy a relapse occurred and a stricture formed in the membranous urethra. An x ray of the pelvis showed sclerosis of the pubic bones following healing of the osteitis pubis. A shadow was noted which was thought to be in the posterior urethra and which had the appearances of a sequestrum. At urethroscopy a spicule of bone was removed from a mass of granulation tissue. Convalescence was satisfactory.

Enteric Fistula Associated with Osteomyelitis of Hip and Spinal Column. The unusual nature of the complication of enteric fistula associated with osteomyelitis and the difficulties encountered in its management prompted James M O'Leary, Paul R. Lipscomb and Claude F Dixon[9] (Mayo Clinic and Found.) to report three cases.

CASE 1.—Man 26 with osteomyelitis of the right hip for 12 years and recent drainage of fecal material and gas from the sinuses about the hip was first seen in March 1941. The fecal stream was diverted by proximal loop colostomy. About 1½ months later the fistulous tracts were explored and enlarged. Drainage diminished, and in 15 months the sinuses had become smaller. In June 1942, an attempt was made to close the rectal fistulas. A portion of the descending colon including the colostomy site, was resected and a new colonic stoma made. A right subdiaphragmatic abscess developed and was drained. In September 1942, the patient complained of cough with purulent sputum. Empyema of the right pleural cavity with a bronchopleural fistula was diagnosed. Open drainage was established and the patient discharged a month later in good general condition.

In June 1943 he complained of purulent drainage from the rectum and hip sinuses. There had been no fecal drainage. Operation in October 1944 demonstrated three fistulas from the midrectum which had formed sinus tracts and become external near the right hip joint. These were closed, but the sinuses continued to drain. Despite another operative procedure in October 1945 purulent drainage continued from the hip area. In January 1947 the sinus tracts were explored and three sequestra were removed healing progressed rapidly. In July 1947 there was no drainage. In October 1947 the colonic stoma was

(9) Ann. Surg 140:897-900 December 1954

closed. In September 1950 the patient complained of stiffness of the right hip joint with marked deformity in external rotation, but there had been no drainage since sequestrectomy Occasional pain was the only complaint when he was last seen in August 1953.

CASE 2—Man, 26 first seen in October 1940 had a 19 year history of osteomyelitis of the left hip and a 2 year history of purulent drainage from the rectum and fecal drainage from a wound in the hip Curettage of the sinuses was done. He was not seen again until about four years later when he complained of continuous drainage from all the sinuses about the left hip Several fistulas arising from the descending and sigmoid colon and from the rectum were noted, and loop colostomy was carried out. Ten months later in August 1945 he returned for closure of the fistulas The descending colon was resected postoperatively a fecal fistula developed at the lower end of the abdominal incision. In June 1947 because of persistent draining fistulas it was decided to do a radical sequestrectomy No true sequestra were found but considerable necrotic tissue and granulation were present. Inoculation of this material into guinea pigs produced tuberculous lesions. The patient was placed on streptomycin and para aminosalicylic acid. In June 1948, the abdominal fistula was excised because of persistent drainage. Eight months before a clinic visit in July 1950 purulent rectal drainage and fecal drainage from the left hip returned. An abdominal fistula developed during a course of medical treatment. Exploratory surgery in August 1950 resulted in temporary cessation of drainage all fistulas were draining again by September 1951 The fistulas have continued to drain intermittently despite antibiotics and chemotherapy

CASE 3—Youth 17 first seen in October 1945 had an eight year history of chronic osteomyelitis of the right hip with a draining sinus. Osteomyelitis of the right elbow had cleared after incision and drainage. X rays of both areas demonstrated changes of chronic osteomyelitis. Opaque injection of the sinus tract showed its rectal communication. Loop colostomy extensive curettage of the fistulous tract and sequestrectomy were carried out in July 1946. All drainage ceased and the wound healed by August. Intestinal continuity was re-established in February 1947 Corrective subtrochanteric osteotomy was performed There was no further drainage or enteric fistula and the osteomyelitis was quiescent in January 1951

The mechanism of recurrence seems to have a basis in the development of an abscess between the osteomyelitic tract and the intestine The abscess ruptures into the intestine and the bony tract to re-establish the fistula

Actinomycosis of Humerus L J McCormack J A Dickson and A R Reich[1] (Cleveland Clinic) report a case of

(1) J Bone & Joint Surg 36 A 1255 1258, December 1954

primary actinomycotic osteomyelitis of the humerus with culture studies in which the diagnosis was initially suspected on frozen section examination

Man 44 had a history of insidious, dull progressive pain in the right arm of three months duration which became constant It was relieved by heat and aggravated by movement. The hand was swollen and he was unable to close it. The skin was somewhat mottled and a



Fig 58 (left) —Irregular destruction of shaft of humerus.
Fig 59 (right) —"Ray form in tissue removed for biopsy Peripheral "clubs" are prominent. Gram stain x 575
(Courtesy of McCormack, J L. *et al.* J Bone & Joint Surg 36-A 1255-1258, December 1954)

tender warm, firm mass was present over the anterolateral surface of the midshaft of the right humerus. Movements of the shoulder were restricted by muscle spasm. A roentgenogram of the right humerus revealed the medullary cavity in the midshaft to be widened and irregularly radiolucent (Fig 58) Biopsy was performed to clarify the

blue-staining peripheral margin of "clubs." A culture revealed actinomyces growth was inhibited by penicillin. Massive penicillin therapy was instituted locally and parenterally, total dosage being 34,800,000 units. The patient has been asymptomatic for two years. Roentgenograms 18 months after therapy showed an apparently healed lesion.

Frozen section examination provided information that simplified the clinical problem and prevented tissue fixation before adequate bacteriologic studies. A histologic diagnosis alone could be erroneous as to the exact nature of the offending organism. The knowledge of the sensitivity of this organism to penicillin proved invaluable.

Echinococcus Disease of Bone. Report of Case is presented by David C. Kelsey and Harry F. Sproat[2] (Brooke Army Hosp., *Fort Sam Houston, Tex.*)

Man, 50, who had spent his youth working with sheep in the area around San Juan, Puerto Rico, had a vague, generalized dull aching pain and a feeling of diminished strength in the left arm and elbow for three weeks. The only positive physical finding was the examiner's impression that the left humerus felt wider than the right. There was a persistent eosinophilia (3-6%). The complement fixation test for echinococcus was negative; the intradermal test of Casoni was not carried out. Roentgenograms of the left humerus revealed a thickening of the cortex and multiple areas of radiolucency (Fig. 60). Biopsy revealed osseous hydatidosis. There was no laboratory, roentgenographic or physical evidence of other areas of echinococcus infection.

Microscopically, the picture was that of many microcysts which partially occupied the marrow space of the bone and appeared within the lacunae. The cyst wall consisted of a pale acidophilic material which was nonrefractile and somewhat collagenous. The wall varied in thickness and occasionally appeared faintly layered. On the inner aspect of the cyst wall there was generally a single cell layer. Occasionally throughout the section there was an area which exhibited focal piling up of the basal layer of cells into a somewhat pyramidal architecture (Fig. 61). The reaction of the bone seemed to be that of pressure atrophy.

Surgical Lesions of Coccidioidomycosis are discussed by H. D. Cogswell, E. W. Czerny and J. M. Fritz[3] (Tucson, Ariz.). Coccidioidomycosis is usually acquired by inhaling the chlamydospores of the fungus which are carried in dust

(2) J. Bone & Joint Surg. 36-A: 1241-1248, December 1954.
(3) A.M.A. Arch. Surg. 40: 633-642, May 1955.

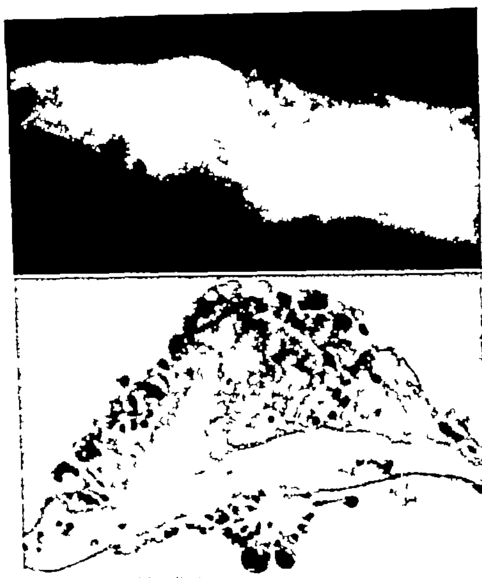


Fig 60 (top) —Preoperative x ray showing echinococcus disease in distal end of humerus.

Fig 61 (bottom) —Pyramidal architecture with maturation ×437

(Courtesy of Kelley D. C., and Sprout H. F J Bone & Joint Surg 36-A 1241 1248, December 1954)

The incubation period varies from one to three weeks After the chlamydospores have entered the human host, usually lodging in the lung they round into spherules The fungus spreads in the host by rupture of the spherule wall releasing the endospores which grow into mature spherules (Fig 62) These may be carried by the blood or the lymphatics to distant organs disseminating the disease. In the patients studied by the authors the fungus apparently went through

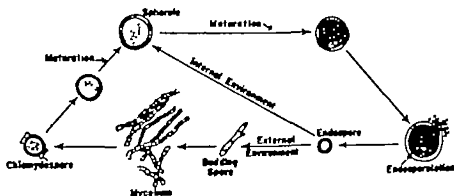


Fig. 62.—Schematic illustration demonstrating life cycle of Coccidioides immitis. (Courtesy of Cogswell, H. D., et al A.M.A. Arch. Surg 40 633-642, May 1955 redrawn from Forbus and Bestebreurtje Military Surgeon 99 659 November 1946.)

a primary and secondary (disseminated) stage, finally localizing in one or more of the viscera.

Chest lesions are the commonest foci that need surgical treatment. Indications for surgery are (1) spontaneous pneumothorax with a nonexpansible lung (2) gross hemoptysis with a persistent cavity (3) solid tumor of the lung in older persons that cannot be definitely diagnosed as coccidioidomycosis and (4) a large, blocked or expanding cavity Segmental resection lobectomy or decortication are the usual surgical procedures

Bone lesions (Fig 63) are probably the commonest in patients who have survived the period of dissemination Amputations of peripheral extremities were necessary in a number of patients because of osseous fistulas pain deformity and disability Immobilization rest and occasional incision and drainage constitute the treatment of choice in coccid



Fig 63—Coccidioidal abscess of upper left tibia. (Courtesy of Cogswell, H D., et al.: A.M.A. Arch. Surg 40 633-642 May 1955)

ioidomycotic bone lesions until a specific chemotherapeutic agent is discovered.

Tuberculosis and coccidioidomycosis can appear in the same bone Monoarticular coccidioidal arthritis and coccidioidal tenosynovitis have been reported

Treatment of Bone and Joint Tuberculosis with Streptomycin and PAS J Hald[4] (Martina Hansens Hosp Sandvika Norway) reports the late results in 245 patients with bone and joint tuberculosis given chemotherapy Streptomycin

(4) Acta tuberc. scandinav 30:82 104 1954

and PAS were most often used in connection with surgical treatment.

Adults were given 0 5 Gm streptomycin twice daily for 30-60 days Children received 0.20-0.25 Gm daily The daily dose of PAS was 10-14 Gm most patients were given this medication preoperatively for 14 days The majority received 1 000 Gm PAS or more. Streptomycin resistance demonstrated on culture developed in four patients and moderate sensitivity in one These five were given streptomycin without PAS

Chemotherapy was used in 76 patients with tuberculous spondylitis In 23 excision of a sinus or evacuation of a tuberculous abscess was done Nineteen experienced primary healing without relapse Eight patients with iliosacral joint tuberculosis were treated by arthrodesis and chemotherapy All obtained primary healing which was maintained In 11 patients with trochanteric bursitis primary healing was obtained after operation but 6 had relapse 8-40 months later Results of treatment of tuberculosis in this location have not so far been improved by chemotherapy Hip joint resection and arthrodesis were performed on 31 patients In eight preparatory treatment of sinuses and abscesses was necessary Of 23 patients on whom a one stage operation was done 19 obtained primary healing with a good result.

Intra articular injection of streptomycin was used in 13 patients with knee joint synovial tuberculosis On the latest control examination 14-48 months after treatment 10 were well and 3 had relapsed The 10 who responded favorably could extend the knee fully and in 7 there was no visible or palpable difference between the two knees The observation periods are short, but results are encouraging

Although chemotherapy was useful in ankle and foot lesions operations in these locations before the use of such therapy also gave good results

Without simultaneous operative treatment chemotherapy does not seem to have any appreciable influence on development or repair of bone tuberculosis nor do the drugs prevent occurrence of new lesions Chemotherapy should not be used indiscriminately in all cases as soon as diagnosis has been made but should be reserved as an aid during surgical treat

ment Streptomycin and PAS afford greater certainty of primary healing after operation on tuberculous tissue Even patients with long standing chronic sinuses should be given a chance with such treatment

Management of Tuberculous Hip Joint is discussed by Walter Mercer[5] (Edinburgh) For diagnosis of a tuberculous hip joint biopsy of the deep inguinal lymph nodes is more important than arthrotomy since the bacilli are filtered to the nodes and are more likely to be found If results of lymph node biopsy are equivocal synovial biopsy is advisable

Streptomycin and associated drugs make possible direct surgical attack on the joint. In patients seen early therefore one may hope for a mobile joint and in patients seen late a shorter period of immobilization earlier and quicker fusion and fewer if any complications However these drugs do not supersede a sanatorium regimen but merely reduce the time in which it is necessary Each of the following drug combinations is satisfactory (1) streptomycin sulfate 1 Gm daily with sodium para-aminosalicylate 5 Gm four times a day (2) streptomycin sulfate 1 Gm daily with isoniazid 100 mg twice a day (3) isoniazid 100 mg twice a day with sodium para aminosalicylate 5 Gm four times a day With any of these combinations the incidence of drug resistance should be exceedingly low Chemotherapy should be continued for at least three months after the local lesion is quiescent and well under control

An extra articular focus should be excised after antibiotics have been administered It is useful to fill the cavity with cancellous bone chips and to use streptomycin and penicillin powder locally A complete reconstitution of the bone and a mobile hip may be expected

In synovial disease, early decompression will save the joint In carrying this out as much of the diseased synovial membrane as possible with part of the capsule must be removed This procedure will lead to a higher percentage of mobile hips The only form of immobilization necessary during treatment is by skin traction

If the articular cartilage is intact the diseased focus is thoroughly eradicated and the area packed with cancellous

(5) J Bone & Joint Surg 36-A 1123-1128, December 1954

bone chips Penicillin and streptomycin powder are used locally The joint must be immobilized for a few weeks. A certain proportion of hips will still heal by fusion or may require arthrodesis later but it is remarkable how many will have mobility at the end of treatment If the articular cartilage is damaged bony fusion is necessary Brittain s arthrodesis is infallible in securing union

A tuberculous abscess should be removed as soon as possible usually by aspiration However drainage by incision may become necessary

Radiologic Aspects of Osseous Lesions of Leprosy are discussed by A Negre and R. Fontan[6] (Papeete, Tahiti) Osteoporosis and decalcification as primary alterations are rare in leprosy and are principally secondary phenomena. Osteolysis and osteoclastic activity are the primary mechanisms of most lesions of this disease Reconstructive osseous reactions adjacent to the lesions of Hansen s disease are rare soft tissue calcification adjacent to areas of destruction are quite frequent in osseous leprosy

The lesions are most often bilateral and frequently symmetrical Neurotrophic lesions are found in the feet with lesions scattered through the phalanges metatarsals and tarsals in the hands with frequent involvement in the fingers less frequent in the metacarpals and even less in the carpals in the nasal accessory sinuses and base of the skull and in the patella There seems to be no relation between leprous contractures and articular lesions though if they coexist deformity is aggravated owing to a tendency for dislocation to occur The location of skin lesions does not necessarily correspond with that of the osseous changes

Conditions to be considered in differential diagnosis include Charcot Marie-Tooth disease, lesions of the cauda equina peripheral neuropathy tabetic neuropathic joint disease syringomyelia sclerodactylia Buerger s disease Raynaud s disease diabetic gangrene, Kohler s disease bone sarcoid gout and maduromycosis

(6) J radiol. et électrol 36 141 154 1955

TUMORS, CYSTS AND FIBRODYSPLASIA

Importance of Differentiation of Serum Proteins in Diagnosis of Bone Tumors is emphasized by Bela Gimes and Zoltan Szendrői[7] (Univ of Budapest) Occasionally x ray study is of no help and clinical investigation is necessary to make a differential diagnosis By paper electrophoresis the changes in serum proteins have been systematically investigated

In benign bone tumors e.g chondroma fibroma and bone cyst, the albumin globulin ratio is within normal limits (1 1 6) In inflammations and malignant tumors the ratio is abnormal In primary and secondary malignant bone tumors the total protein content of the serum was not diminished but the albumin-globulin ratio was depressed with an increase of the $alpha_2$ fraction characteristically found in myelogenic sarcomas and metastatic bone tumors In cases of plasmacytoma typical changes of the alpha beta and gamma globulins were found. In inflammatory bone processes with original x ray appearance simulating sarcoma an increase in gamma globulin fractions was associated with the decrease in albumin globulin ratio In three cases in which roentgen diagnosis failed the proper diagnosis was arrived at by electrophoretic methods The possibility that an inflammatory condition may simulate a neoplasm on x ray is enhanced by the use of antibiotic therapy and in such cases electrophoretic studies may be important.

Aneurysmal Bone Cyst. Observations on 26 cases by David C Dahlin Byron E Besse, Jr David G Pugh and Ralph K Ghormley[8] (Mayo Clinic and Found) reaffirm their belief that aneurysmal bone cyst is a distinct clinical and pathologic entity Average age of the patients was 17.2 years (range 5 37) with 18 under 20 There were six tibial lesions five fibular three femoral one humeral and one ulnar five in the vertebrae, two in the ilium and one each in the sternum rib and an occipital bone. The most frequent clinical

(7) Fortschr Geb. Röntgenstrahlen 81 567 582, November 1954
(8) Radiology 64 56-65 January 1955

complaints were pain swelling limitation of motion and tenderness Duration of symptoms varied from three weeks to three years (average about six months) In all probability associated trauma merely called attention to the lesion by causing a local exacerbation of symptoms Results of treatment indicate the benign nature of the cyst

In typical cases the roentgen manifestations consisted of a well circumscribed rarefied area usually located eccentri



Fig 64 (left) —Aneurysmal bone cyst in ilium. Typical example with blown out appearance of cortex, thin outer shell of bone interior radiolucency and coarse to fine trabeculae

Fig 65 (right) —Aneurysmal bone cyst in upper part of shaft of humerus, which involved entire width of bone expanded cortex laterally and caused slight medial erosion of cortex. Epiphysial plate is intact

(Courtesy of Dahlin, D C., et al Radiology 64 56-65 January 1955)

cally in the bone which showed either fine or coarse trabeculae or both The trabeculae appeared coarser and more numerous toward the edges of the lesion producing a characteristic soap-bubble or honeycombed appearance. The cortex bulged eccentrically or was absent at the periphery of the affected segment often only irregular remnants remained (Figs 64 and 65) Without exception in typical cases in which the cortex was disrupted there was a thin shell of bone representing periosteal new bone around the periphery of the lesion In long bones the end of the shaft was the site of predilection If endochondral bone growth was still taking place the lesion was always on the diaphysial side of the

epiphysial cartilage and adjacent to it The tumor did not invade the epiphysial cartilage. In older patients in whom the epiphysial cartilage was no longer present the epiphysial portion of the bone was affected but generally the articular cartilage was intact and the joint cartilage space preserved Size is apparently in direct proportion to duration of the lesion In about 16 of the cases a roentgen diagnosis could have been made preoperatively with reasonable certainty

The gross and microscopic pathologic picture was typical in all cases The surgeon usually delivered the specimen with some comment on difficulty in controlling hemorrhage Grossly characteristic cavernous spaces separated by fibrous tissue septa are seen Varied histologic patterns are observed in different portions of the cysts If sections are cut through the solid tissue and not through the honeycombed areas the lesion may be mistaken for an atypical giant cell tumor The various-sized engorged vascular spaces whose walls lack most of the features of normal blood vessels the connective tissue septa often containing thin strips of osteoid and the pools of unclotted blood in the vascular spaces are diagnostic of aneurysmal bone cyst.

Curettage is the treatment of choice and at the time of operation the gross appearance should make diagnosis possible

Giant Cell Tumor or Osteoclastoma. Sven Werne[9] (Univ of Lund) reports 13 cases of giant cell tumor seen from 1942 to 1952 7 with recurrence, in 2 of which malignant transformation was noted

CASE 1.—Woman 32 with giant cell tumor of the proximal femur had recurrence after surgical curettage and several x ray treatments. After five years, histologic examination revealed a giant cell tumor with sarcomatous malignant cells There had been no recurrence three years after radical resection.

CASE 2.—Woman 53 had giant cell tumor of the distal femur Three years after curettage and irradiation a malignant recurrence appeared. No further changes were noted since total resection.

There are 20 published cases following the course of giant cell tumor from benign to malignant It is important to know that some parts of the tumor may be histologically benign and other parts malignant making multiple biopsies oblig-

(9) Chirurg 26:346-351, August, 1955

atory Radical resection should be done in recurrence of even histologically benign tumors The malignant giant cell tumor unlike the benign tumor is not x ray sensitive

Nonosteogenic Fibroma of Bone Review of Literature with Addition of Six Cases James A Devlin Harold E. Bowman and C Leslie Mitchell[1] (Henry Ford Hosp) ob-



Fig 66—Preoperative x-rays showing fracture through oval, eccentric, cystic lesion with well defined medullary border Cortex is thin. (Courtesy of Devlin, J A et al J Bone & Joint Surg 3 A 472-486, June, 1955)

served five boys and one girl aged 6-14 with nonosteogenic fibroma of bone In all a long tubular bone of the lower extremity was affected In half discovery of the lesion was associated with local trauma Two had a fracture of the bone involving the tumor area.

The x ray findings were similar throughout The lesions were located in the ends of the shafts of the long tubular

(1) J Bone & Joint Surg 37 A 4 2-486 June, 1955

bones close to but not reaching the epiphysial plate They were all eccentric and somewhat oval in outline with the greatest diameter in line with the long axis of the bone Only a fibular tumor tended to extend completely across the bone Loculation of various extent was a constant finding A well defined medullary border was found in most instances The cortex was thinned in the involved area in four cases The lesions were about 3.8 cm long (Fig 66)

Histologically the lesions consisted of spindle shaped



Fig 67 —Section of lesion showing whorled arrangement of fibrous tissue, presence of giant cells and absence of bone formation ×100 (Courtesy of Devlin, J A, et al. J Bone & Joint Surg 37 A 472-486 June, 1955)

connective tissue cells with a tendency to interlace or to form whorls (Fig 67) The cellularity of the lesions varied and there was variation in cellularity within individual lesions In most lesions giant cells were prominent Usually the giant cells were small and somewhat elongated In many fields there was hemorrhage but generally the tumors did not have a profuse blood supply

Differential diagnosis should include osteogenic sarcoma simple bone cyst osteitis fibrosa giant cell tumor and fibrous dysplasia.

All patients were treated surgically The lesion was curetted, and in four patients the cavity produced was packed with cancellous bone. In three there was evidence that part

of the lesion persisted These defects were noted as long as one year after surgery but showed no increase in size. In another patient the lesion recurred without causing trouble No patient received x ray therapy

[It is most gratifying to note this careful differentiation between the nonossifying fibroma and other lesions which contain giant cells. Similar co-operation between orthopedic surgeons pathologists and roentgenologists would help reduce to a minimum the errors and consequent confusion which results, due to the careless classification by some general pathologists of every lesion with giant cells as a giant cell tumor —Ed.]

Lipoma of Os Calcis. Proctor L Child[2] (Fitzsimons Army Hosp, Denver) states that only three cases of primary intramedullary lipomas of bone have been reported before He describes the fourth case

Man, 22 for two years had had dull aching pain in the right heel, aggravated by standing running or walking long distances. Physical examination revealed nothing except slight tenderness on pressure over the plantar surface of the right heel All routine laboratory procedures including acid and alkaline phosphatase, total protein and albumin-globulin ratio serum calcium and 24 hour urine calcium ex cretion were normal X rays revealed negative findings in chest and long bones An area of radiolucency measuring 1.5 × 2.5 cm. was not ed in right os calcis. Preoperative diagnosis was solitary bone cyst.

At surgery a gritty oily mass of translucent fatty tissue measu ing 2 5 × 1 5 × 1 0 cm. was removed. Numerous bony spicules tr versed the lesion and at one side a semilunar mass of gray white brous tissue was noted on the cut surface. Hematoxylin-eosin st showed a tumor composed of normal fat. In addition to the usual brous tissue septums, bony spicules separated the lobules of fat. semilunar mass represented a broad sheet of partially hyalinize brous connective tissue. Areas of necrosis were found throug the tumor with breaking down of cell borders and coalescence of There was no evidence of foreign body reaction inflammatio malignancy

The three basic types of lipomas involving bone are mary intramedullary periosteal (or parosteal) and second ary lipomatosis Intramedullary lipoma is an entity perhaps related to periosteal lipoma but distinct from vertebral lipoma and bony involvement secondary to diffuse lipomatosis

Multiple Lymphangiectases of Bone Jonathan Cohen and John M Craig[3] (Children s Med. Center Boston) report a case.

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(2) Am. J Clin. Path. 25 1050-1052, September 1955

(3) J Bone & Joint Surg 37 A 585-596, June, 1955.

Girl 8 was noted at age 3 to have limited motion of the neck This increased, and the neck region became painful during an acute febrile illness. X rays showed a destructive lesion of the cervical spine and a small cystic lesion in the right humerus. Fever and cervical pain disappeared when the neck was immobilized. A few months later a painless limp developed. X rays revealed a cystic area in the right femur After another febrile episode a nontender swelling in the neck appeared shown on x rays to be due to a pathologic fracture of the clavicle (Fig 68) A biopsy from this area revealed no specific lesions. During the next 3½ years there was a gradual progression



Fig 68 (left) —X-ray showing fracture of clavicle and erosive character of lesion; also small punched-out areas of loss of bone substance later proved to be lesions, in humeral head and metaphysis and acromion.

Fig 69 (right) —Extension of process to involve 2d-6th cervical vertebrae. There is compression without marked wedging of the bodies of these vertebrae. Some soft tissue swelling is evident. Multicentric erosive foci ar characteristic.

(Courtesy of Cohen, J and Craig J M: J Bone & Joint Surg 37 A 585-596, June, 1955)

of the cervical lesions, with involvement of all of the cervical and the first three thoracic vertebrae (Fig 69) as well as involvement of the ribs, scapula, ischium and pubis. A biopsy specimen from the right ilium was not diagnostic. A year later severe weakness of all four limbs developed. The spinal collapse in the cervical area progressed. A few months later the patient died in respiratory failure.

At autopsy the disease seemed to be one of destruction of bone in many areas by gradual pressure of enlarging lymphatic vessels. These vessels communicated with extraosseous lymph channels

One of the causes of death presumably was encroachment of the lymphatic vessels on the pleura followed by accumulation of large volumes of fluid in the pleural cavities The manner of origin of the anomalous lymph spaces in bone was not apparent However extensive clinical observation

and autopsy findings were not sufficient to classify the process as one of neoplasm malformation or inflammation

Radiologic Aspects of Eosinophilic Granuloma of Bones, Especially Femur and Clavicle Marcel Fèvre[4] (Paris) considers certain radiologic aspects of eosinophilic granuloma of the femur and clavicle distinctive enough to establish a diagnosis with certainty whereas others especially those found at the outset are open to question Comparatively early lesions two and seven months respectively after the first appearance of pain are shown in Figures 70-72 Five important features of the radiologic syndrome are evident in Figures 70 and 71 which show the right femur of a boy 4 These are localization in the upper third of the femur fusiform appearance presence of a geode cortical involvement and subperiosteal neocortical hypertrophy The same features were found in another boy 8 who was originally thought to have a rheumatic condition and was referred to the author s service for operation x rays disclosed the bone lesion (Fig 72) and an operation was done with the results shown in Figures 73 and 74 On the whole the x rays of these two patients which show a rare similarity suggest that the lesion after originating in the medullary canal attacks the bone and gives it a lacunar appearance. The destruction is accompanied by reactive cortical hyperostosis but this process of destruction and growth can be distinguished from a malignant process because it is not anarchic.

X rays of the femur taken when the disease was at its height in a child, 4 are shown in Figures 75-77 He had been ill for more than 1½ years with a multifocal condition diagnosed osteomyelitis The characteristic high diaphysial site of the lesion, fusiform appearance central lacuna and cortical hyperostosis were all present and the progressive aggravation was clearly shown Histologic studies supported the diagnosis of eosinophilic granuloma. Operative treatment of the femoral lesion was successful the other lesions likewise responded to treatment and a cure was finally obtained

The radiologic pictures presented by eosinophilic granulo-

(4) Rev chir orthop. 41 3-31 Jan. Mar., 1955

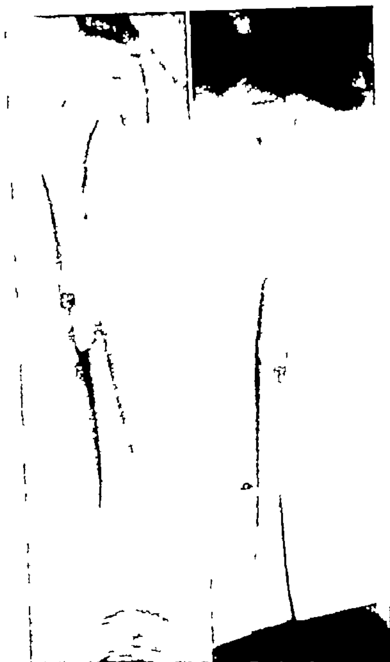


Fig. 70 (left) —Frontal view of eosinophilic granuloma of right femur
Fig 71 (right) —Lateral view showing fusiform aspect (more pronounced than in frontal view) central geode with rounded contours and neocortical hypertrophy
(Courtesy of Fèvre M. Rev chir orthop. 41 3-31 Jan. Mar., 1955)



Fig 72 (left) —Preoperative x-ray showing central lacuna and neocortical hypertrophy by stratified apposition of subperiosteal bone.
Fig 73 (center) —Fifteen days after operation.
Fig 74 (right) —Four months after operation. Cure resulted, but fusiform hypertrophy persisted.
(Courtesy of Fèvre, M Rev chir orthop. 41 3-31 Jan. Mar., 1955)



Fig. 75 (left) —Eosinophilic granuloma of right femur when lesion was discovered.
Fig. 76 (center —Five months later
Fig. 77 (right) —Seventeen months after discovery of lesion.
(Courtesy of Fèvre, M. Rev chir orthop 41:3-31 Jan. Mar., 1955)

mas localized elsewhere in the femur as well as in the clavicle skull slender long bones such as the peroneum and the vertebrae are not always easy to interpret However when the three characteristic elements of total osteolysis especially diaphysial osseous defects with rounded contours and peripheral hyperostosis appear concurrently a diagnosis of eosinophilic granuloma should be seriously considered

[The author has reported a number of interesting cases which he has diagnosed as eosinophilic granuloma. A review of the roentgenograms has revealed that several of the lesions of the femurs are most atypical of this condition. Only a most careful study of the microscopic sections would convince me that some of these lesions are in reality as they have been diagnosed. In Figures 70 and 71 the roentgen appearance is far more typical of the lesion which in this country we have learned to call a nonossifying fibroma. Because this lesion does have some eosinophils and because it contains a varying number of giant cells, it has been named by a few pathologists a cortical giant cell tumor The prognosis is about the same, and after surgical intervention, healing occurs in a relatively short time. The lesion in the femur shown in Figure 72 includes so much increase in thickness of the cortical surrounding bone that it strongly suggests a chronic sterile bone abscess. I have never seen a lesion such as that shown in Figures 75-77 which was caused by the eosinophilic granuloma. The soap-bubble appearance and the marked increase in the total diameter of the shaft of the femur with a shell like zone of surrounding bone is much more typical of the true giant cell tumor although its location is farther from the epiphyses than such lesions usually are found. I am not attempting to confuse the issue by asserting that the author Marcel Fèvre, could be mistaken about his diagnoses but call attention to the fact that these lesions are atypical. Any bone pathologist would be skeptical of the diagnosis unless he were permitted to study the microscopic sections.—Ed.]

Disappearing Bones Rare Form of Massive Osteolysis L W Gorham A W Wright H H Shultz and F C Maxon Jr[5] (Albany Med College) report two cases with autopsy findings in one Sixteen previously reported cases are reviewed

Case 1—Youth, 16 was hospitalized because of deformity and pain in his right clavicle which had been fractured six months previously A deep depression was present over the middle portion of the clavicle (Fig 78) X ray examination showed absence of the right clavicle except for an indefinite small fragment at the acromial end. Much of the scapula was also missing particularly the superior portion where only a small portion of the coracoid process remained. The second rib except for 7 cm. of its head, was absent. Alkaline

(5) Am. J Med 17 674 682 November 1954

phosphatase was elevated to 8.7 Bodansky units about twice normal for adults but of questionable significance in the boy

About 10 months later pain was still present. There was further destruction of the right scapula, and the head and neck of the right humerus, upper three ribs on the right and upper three dorsal vertebrae were now involved. Biopsy of the third rib failed to clarify the cause and nature of the generalized atrophy Five months later the patient was admitted because of increasing pain, progressive generalized weakness, severe exertional dyspnea anorexia and dull, nonradiating epigastric pain. X ray examination revealed evidence of massive pleural effusion on the right with displacement of the mediastinal structures to the left (Fig 79) The destructive changes had increased. Repeated thoracenteses were performed. The patient became steadily worse and died two years five months after fracture of the clavicle.



Fig 78 (left) —Depression in right clavicle.
Fig 79 (right) —Extensive osteolysis and pleural effusion.
(Courtesy (Gorham, L. W., et al. Am. J Med. 17 674-682 November 1954)

The most significant histologic changes were in the soft tissues of the chest wall and mediastinum and in various bones. There was extensive chronic active cellulitis with diffuse hyperemia, edema and inflammation. Atrophy and diffuse interstitial fibrosis were present. Perineural inflammation and fibrosis were striking Bone marrow vascularity was so significant as to lead to a diagnosis of hemangiomatosis.

Case 2.—Man 44 complained of right shoulder pain, precipitated

six months previously when he reached above his head. There was no history of trauma. Roentgenograms revealed absence of the outer third of the right clavicle with some gouging of the middle third the inner third appeared normal X ray examination about 20 months later showed complete absence of the lateral half of the right clavicle and of the entire coracoid process. The upper margin of the right scapula and part of the glenoid process were destroyed. Shortly after ward there were two episodes of abscess formation in the right triceps area, which responded to antibiotics and incision and drainage. Nine months after the last recurrence the patient fell from a ladder and fractured the right humerus

Angiomatosis usually hemangiomatosis has been found in the affected bones or in the surrounding soft tissues in enough cases to make it a possible factor by causing a disturbance in the balance of osteoblast-osteoclast activity Diffuse inflammation of the soft tissues about the affected bones may play an indirect role in causing bone atrophy by irritation or compression of peripheral nerves thus leading to trophic disturbances in bone and also in other tissues

Tumors of Periosteal Origin, discussed by Louis Lichtenstein[6] (Wadsworth Gen'l Hosp Los Angeles) can be divided into benign and malignant groups

In benign tumors the periosteal fibroma is of circumscribed character and limited size It is often encountered on the lower femur in the supracondylar region The practical importance of its recognition is in the fact that it may be mistaken for sarcoma.

Neurofibromas may develop within the periosteum as one of the numerous skeletal manifestations of Recklinghausen s disease If malignant change ensues in neurofibromatosis as it commonly does such schwannian tumors may extensively erode and invade contiguous bones e.g multiple bodies of the vertebral column

Periosteal chondroma is a slowly growing neoplasm of comparatively small size that develops within the periosteal connective tissue and characteristically erodes and induces appreciable sclerosis of the contiguous cortical bone It should be differentiated from osteochondroma as well as from solitary enchondroma It is seen at any age. The usual symptoms are pain gradual swelling and tenderness

(6) Cancer 8 1060-1069 Sept -Oct 1955

Periosteal lipoma is a rare benign tumor which on x ray examination appears as a well outlined ovoid translucent soft tissue mass abutting on the contiguous bone usually a long limb bone When fully developed, it may produce discernible swelling

Malignant periosteal tumors include malignant fibroblastic tumors which are encountered occasionally They seem to arise from the periosteal connective tissue and produce a slowly enlarging mass intimately attached to the external surface of the affected bone They may sometimes erode the underlying cortical bone. Lichtenstein found them of rather low grade malignancy with a tendency to relatively slow growth and local recurrence after incomplete surgical extirpation

Malignant periosteal tumors composed entirely of cartilage are comparatively rare although some periosteal sarcomas may show conspicuous fields of tumorous cartilage.

Periosteal osteogenic sarcoma apparently develops through progressive active proliferation of bone forming periosteal connective tissue and appears on the surface of large limb bones rather than in the interior The femur particularly is a site of predilection though occasionally the tibia, the humerus or some other long bone may be affected The tumors are further distinguished from the conventional intramedullary osteogenic sarcomas by their more favorable course and substantially higher survival rate.

Interscapulothoracic Amputation for Diffuse Angiomatous Malformation is described by Elliott S Hurwitt and Austin Johnston[7] (Montefiore Hosp New York)

Woman, 42, was hospitalized because of pain in the right arm for 2½ years and ulcerations for 9 months. She had a history of duskiness of the right arm at birth, with marked reddening after bathing Abnormalities during the first and second decades were not marked. At about age 22 grapelike masses of dilated vessels appeared below the right elbow Other similar lesions developed elsewhere over the right arm gradually

From age 39 on, she underwent several operations on the right arm. First, the middle third of the right clavicle was resected with temporary occlusion of the right subclavian artery partial excision of huge blood vessel masses of the right arm and forearm, excision of

(7) Ann. Surg. 142 115-120 July 1955.

a portion of the right ulna and clavicular graft to the ulna. A second operation consisted of ligation and division of the right subclavian artery. The circulation to the arm continued good; pains gradually subsided and edema greatly diminished. One and a half years later ulcerated, bleeding skin lesions appeared over the forearm and pain in the fingers. At a third operation the right supraclavicular fossa was explored and an enormous thyrocervical trunk of vessels removed. There was only temporary relief from pain. The ulcerations



Fig. 80.—Postoperative appearance of patient. (Courtesy of Horwitt, E. S., and Johnston, A.: Ann. Surg. 142: 115-120, July 1955.)

broke down again, and the dorsum of the hand and arm became brown and progressively more indurated.

About five months later a right interscapulothoracic amputation was performed. When the subclavian artery was ligated, a thrill and bruit, which was clinically palpable and audible over the entire chest, disappeared. The entire extremity was removed and the wound healed by primary union (Fig. 80). Examination of the removed arm revealed multiple congenital arterial aneurysms and venous ectasia involving the soft tissue, humerus, radius and ulna.

The diffuse vascular malformations probably resulted from arrests of maturation at various stages of embryologic development.

Primary Malignant Tumors of Hand. Robert H Clifford and Alex P Kelly, Jr [8] studied the incidence of malignant tumors of the hand and the relationship of such tumors to those in the body as a whole in 757,827 persons registered at Henry Ford Hospital and its clinics There were 9,741 with pathologically verified malignant tumors an incidence of 1 3% Of these tumors 63 (0 008%) were primary in the hand The hand malignancies represented 0 62% of all malignancies

There were five basal cell lesions of the hand All were cured by a single excision Four malignant melanomas were found on the hands and fingers These included two subungual melanomas a melanosarcoma arising in a blue nevus and a melanoma of the dorsum of the hand. The patient with melanoma of the dorsum was admitted in extremis with metastases and died 37 days after biopsy excision of the primary lesion The patient with melanosarcoma is living without evidence of disease eight years after wide local excision The two with melanotic whitlows were treated by digital amputation one died seven years later without evidence of melanoma and the other is living six years after operation without evidence of disease

There were two malignant bone tumors One was an osteogenic sarcoma of the fourth metacarpal The patient is living without evidence of disease after amputation of the fourth and fifth rays The other patient with a Ewing endothelioma of the proximal phalanx of the middle finger died five months after amputation of the involved ray Autopsy showed widespread metastases

There were five sarcomas—one mesotheliosarcoma and four fibrosarcomas The mesotheliosarcoma has shown no evidence of recurrence nine years after local excision Three patients with fibrosarcoma are free from disease two after wide excision 20 and 26 years ago and one after amputation of the hand 11 years ago One patient died one year after amputation of the hand for an extensive lesion of the thenar eminence.

The ages of 39 men and 8 women with squamous cell carcinoma varied from 40 to 86 Average size of all lesions was

(8) Plast. & Reconstruct. Surg 15:227-232, March 1955

1 3 cm No correlation was noted between the duration and size of the lesions The larger lesions appear to carry a worse prognosis The grade of malignancy was low in most cases Only five patients had metastases on clinical examination Local excision is adequate for small lesions If the lesion is fixed to underlying structures partial amputation of the hand or finger may be necessary In this group the absolute three year cure rate was 70.7%

Fibrosarcoma of Extremities Review of 45 Cases is presented by H H Brindley Charles Phillips and Juan N Fernandez[9] (Temple Tex.) Fibrosarcoma a malignant neoplasm arising from fibroblasts occurs rather infrequently It is usually a firm gray mass often appearing encapsulated and is frequently confused with synovial sarcoma osteogenic sarcoma rhabdomyosarcoma and with many benign lesions of the extremities It must be considered as a possible diagnosis in all abnormal soft tissue masses in the extremities It occurs at any age though more commonly in the middle decades Most patients should and could be cured. Most of those who die of fibrosarcoma have metastases to the lungs though the tumor may metastasize to numerous other areas Occasionally it does not metastasize but continues as a locally invasive lesion When surgery is not feasible, roentgen therapy should be given Occasionally cure is brought about by this method.

The patients in this series were aged 4 months to 77 years 25 were females The thigh was the commonest tumor site, 51% of the tumors occurring there 62% occurred in the lower and 38% in the upper extremities Commonest symptom was presence of a mass Only about 25% of the patients had pain Local recurrences so characteristic of fibrosarcoma, occurred in 54 5% of the patients Five year cure rate was 72% for females and 53% for males These rates indicate that local excision can be successful though it is often followed by local recurrence Radical treatment (amputation) was reserved for more difficult cases If more amputations had been done for the lower grade and more distally located lesions cure rate probably would have been much better

Management of Malignant Disease in Neighborhood of Hip is discussed by Bradley L. Coley and Norman L. Higin-

(9) J Bone & Joint Surg 37 A 602-608, June, 1955

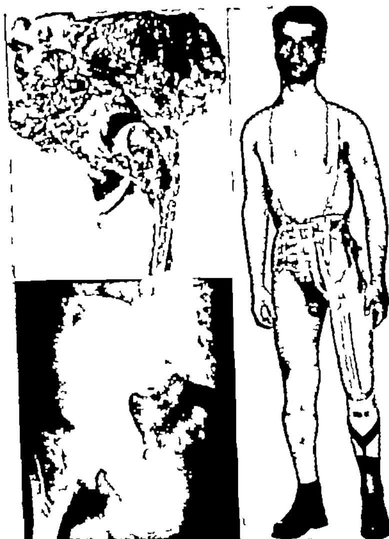


Fig. 81 (top left) —Lesion arising from left ilium of man, 28, with hereditary chondrodysplasia, removed by hemipelvectomy Microscopic examination revealed chondrosarcoma. Previous biopsy report was chondroma.

Fig. 82 (bottom left) —Postoperative x-ray showing complete removal of left innominate bone and lower extremity Note other lesions of chondrodysplasia in right ilium and femur

Fig 83 (right) —Patient wearing prosthesis. He was able to walk well without crutch or cane six months after hemipelvectomy

(Courtesy of Coley B. L., and Higinbotham, N L.: Surg Gynec. & Obst. 99 727 73., December 1954)

botham[1] (Memorial Hosp New York) Malignant disease in this region calls for various methods of treatment depending on the patient s age and general condition exact location of lesion histologic type, radiosensitivity and operability

(1) Surg., Gynec. & Obst. 99 727 732, December 1954

Hemipelvectomy has a distinct place in treatment (Figs 81-83) It is especially indicated in low grade so-called secondary chondrosarcoma where it offers long term palliation or sometimes permanent cure In 27 hemipelvectomies performed for bone sarcoma (6 osteosarcomas 1 malignant giant cell tumor and 20 chondrosarcomas arising on a pre-existing chondroma or osteochondroma) operative mortality was 3 7% Follow up on six determinate cases revealed a five year survival of 33.33%

Hip joint disarticulation also has proved of value in selected cases involving the upper thigh but in doubtful cases it should be discarded in favor of the more radical procedure, since whichever procedure is selected there is little difference in the patient s ability to use a prosthesis Of 41 patients with bone tumors treated by hip disarticulation 27 are dead, 9 are alive for less than five years and 5 are alive for more than five years (or 15% of determinate cases) Of 11 with soft part tumors so treated 6 are dead 4 are alive less than five years and only 1 is alive for more than five years (or 15%)

Roentgen therapy and other agents have been found useful in lieu of surgery for Ewing s sarcoma, reticulum cell sarcoma plasma cell myeloma and metastatic cancer in bone

Before selecting the method of treatment each case should be appraised carefully It should be emphasized that a histologic diagnosis of chondroma on previous operation or biopsy is no assurance that a tumor may not later prove to be a chondrosarcoma (Fig 81) In short clinical and roentgen findings are more valuable than the microscopic report when sarcoma is suggested by the former and chondroma by the latter

Tumors of Synovial Joints Bursae and Tendon Sheaths are discussed by Louis Lichtenstein[2] (Wadsworth Hosp V A Center Los Angeles) Osteochondromatosis is characterized by the formation of numerous chondral and osseous bodies within the lining and sublining connective tissue of the affected structure It is encountered far more often in joint capsules than in bursae or tendon sheaths the knee joint being the commonest site (Fig 84) X rays are sometimes misinterpreted as indicating chondrosarcoma On mi

(2) Cancer 8 816-830 July-Aug 1955

croscopic examination the lining of an affected joint shows numerous foci of cartilaginous or osseous metaplasia or both in varying stages of development The cartilage foci may become calcified or converted to bone At such sites there is initially focal nodular condensation of the connective tissue cells but the synovial lining elsewhere shows no char



Fig 84 (left) —Lesion of osteochondromatosis of a popliteal bursa
Fig 85 (right) —Osteochondromatosis of synovial lining and sublining connective tissue of joint largest body is composed of calcifying cartilage, two smaller ones at surface, apparently being extruded, of condensed, lamellated connective tissue undergoing osseous metaplasia ×10
(Courtesy of Lichtenstein, L. Cancer 8:816-830 July-Aug., 1955)

acteristic alteration (Fig 85) Once the chondral or osseous bodies are formed their growth potential appears to be distinctly limited and without neoplastic tendencies

Pigmented villonodular synovitis bursitis and tenosynovitis is a distinctive, yellow brown villous or nodular lesion encountered in joints bursae and tendon sheaths It may take a number of forms depending on the site and whether it is localized or more diffuse It has the same essential character pathologically in all these circumstances The usual



Fig 86 (top) —Tendon sheath nodule of finger (pigmented nodular tenosynovitis) showing appreciable cellularity and occasional multinuclear cells. Many histiocytic stromal cells contained hemosiderin granules, nondiscernible at this magnification ×100

Fig. 87 (bottom) —Pigmented villonodular synovitis of knee joint showing prominent synovial-lined spaces within thickened synovial membrane, which apparently result from agglutination of villi and should not be misinterpreted as indicating synovial sarcoma; ×125

(Courtesy of Lichtenstein, L. Cancer 8 816-830 July Aug 1955)

form of tendon sheath involvement is the localized nodule, previously designated as giant cell tumor or myeloplaxoma by some and as xanthoma or xanthogranuloma by others (Fig 86)

Whatever its localization the lesion is generally characterized in its early stages by appreciable vascularity conspicuous hemosiderin deposition villous hypertrophy of the lining of the affected structure and agglutination of villi to form synovial lined clefts These eventually become incorporated in webbed matted or solid areas (Fig 87) Appreciable collagenization scattered multinuclear (giant) cells and abundant hemosiderin deposits have also been seen It should be stressed that at the height of proliferation of the histio-



Fig 88.—Ovoid soft tissue shadow of tendon sheath nodule that has eroded contiguous cortex of finger phalanx. (Courtesy of Lichtenstein, L. Cancer 8:816-830 July Aug., 1955)

cytic stromal cells especially before their phagocytic tendency becomes quite obvious the lesion may give the impression of a sarcoma.

The tendon sheath nodules of the nature of pigmented nodular tenosynovitis (so-called giant cell tumor) may in time induce pressure erosion of contiguous bones especially finger and toe phalanges (Fig 88) and occasionally even extend into such eroded bones It has been reported that such erosion should not be construed in itself as indication of neoplastic aggressiveness

Hemangiomas and lipomas affecting joints are uncommon.

The only primary malignant tumor encountered with any degree of frequency in joints as well as bursae and tendon sheaths is the synovial sarcoma. Behavior is in some respects reminiscent of malignant melanoma These tumors were formerly called adenosarcomas At surgical exploration one was thought to be an organizing hematoma and

as such was incised and curetted Despite initial slow growth and circumscribed character of many synovial sarcomas attempts at surgical extirpation are followed in a high proportion of cases by local recurrence and extension and eventually by fatal dissemination Cytologically it has a richly



Fig 89—Selected fields of synovial sarcoma situated in ankle region of boy aged 18, showing conspicuous pseudoglandula formation ×84 (Courtesy of Lichtenstein, L Cancer 8 816-830 J ly Aug., 1955)

cellular essentially spindle cell stroma resembling primitive fibrosarcoma (Fig 89)

In dealing with any tumor in the soft parts of the hand or foot or in the vicinity of the knee elbow and shoulder joints particularly a synovial sarcoma should always be kept in mind

Plasmocytoma with Terminal Dissemination was observed by Jørgen B Dalgaard and Ena B Dalgaard[3] (Univ of Bergen) in four patients The first three patients previously reported on each had a solitary plasmocytoma of a lumbar vertebra with fatal terminal dissemination displaying an actual state of myelomatosis before death Two distinct phases in the course of the disease could be distinguished During the first phase, a true solitary plasmocytoma, con

(3) Acta path. et microbiol. scandinav 37 182 188 1955

firmed histologically was present as shown by hematologic x ray and chemical analyses that failed to reveal the presence of plasma cells outside the primary tumor In this phase sedimentation rate was normal or slightly increased and serum protein levels were normal During the second phase

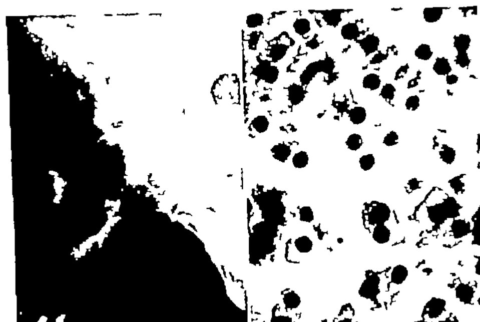


Fig 90 (left) —Polycystic osteolytic defect in right femur Note small trabeculae.
Fig 91 (right) —Section from tumor showing numerous plasma cell some large and irregular and one with two nuclei Hematoxylin-eosin ×1400
(Courtesy of Dalgaard, J B., and Dalgaard, E. B.: Acta path. et microbiol. scandinav 37 182 188, 1955)

definite signs of dissemination were present including plasma myeloma cells outside the primary tumor enormous increase in sedimentation rate and distinct elevation of serum globulin values which could be demonstrated electrophoretically The authors report on a fourth patient

Man, 75 hospitalized due to cystopyelitis had hyperplastic prostate, slight residual urine, albuminuria and coliuria. Hemoglobin values, leukocyte and differential counts and acid and alkaline phosphatase levels were normal but sedimentation rate was between 105 and 116 mm./hour Pyelography accidentally disclosed several irregular walnut sized osteolytic defects in the head and neck of the right femur (Fig 90) the picture being very similar to that of a giant cell tumor X rays of the pelvis femurs and spine did not reveal further defects Total serum protein levels were 7 4 Gm./100 ml., but

paper electrophoresis revealed strongly increased gamma globulins.

Eleven months later he stumbled and broke the right femur at the level of the lesser trochanter He died five days later of myocardial infarction.

Autopsy revealed a large typical plasmocytoma with a relatively benign histologic appearance but with unquestionable, though moderate, dissemination within the medullary system (Fig 91)

On the basis of clinical data it cannot be decided when dissemination occurred and the clinical course cannot be divided into two separate phases as in the previous patients. However the extraordinarily high sedimentation rate and the distinctly pathologic electrophoretic pattern seem to indicate that dissemination may have been present 11 months before death. That the tumor was originally a solitary plasmocytoma is indicated by size relative benign histologic appearance and comparatively limited extent of dissemination Possibly even in this patient the condition might have progressed into real malignant myelomatosis if he had not died of cardiac disease.

Plasma Cell Myeloma Clinical, Pathologic and Roentgenologic Review of 90 Cases is reported by Charles P Carson Lauren V Ackerman and James D Maltby[4] (Washington Univ) The 60 men and 30 women were aged 25-86, the commonest range being 50-70 In 60 patients more than one bone was involved 31 of the 60 (52%) died within three months after diagnosis was definitely established Solitary bone lesions were seen in 18 patients and primary extramedullary tumors in 12 In all but two patients diagnosis was proved by bone marrow smear biopsy or both Follow up information was obtained on all patients Autopsy was performed in 27

The most prominent single symptom was bone pain often in more than one area The most frequent location was the back (70%) Weakness with fatigability weight loss or both was present in almost all patients at some time during the disease One or more pathologic fractures were noted in 43 (55%) of the 78 patients with apparent primary osseous involvement. In some instances good callus formation occurred with rapid healing

(4) Am. J Clin. Path. 25:849-888, August 1955

Neurologic complications were most commonly related to the spine Ten patients had prominent neurologic findings on hospitalization and in all but 2 these were associated with evidence of pathologic compression fracture Of these 10 patients 6 had paraplegia and 3 had difficulty in walking

The microscopic pattern of plasma cell myeloma was usu



Fig. 92—Invasive replacement of bone marrow by plasma cells in all stages of development ×1000

Fig 93 (Inset)—Typical plasma cell in peripheral blood smear, ×1700. (Courtesy of Carson, C. P., et al Am. J Clin. Path. 25 849-888, August, 1955.)

ally characteristic (Fig 92) Broad sheets of closely packed cells were present with apparently little supporting intercellular framework The more mature and predominant cell appeared similar to the normal plasma cell. Its most prominent characteristic was the eccentric position of the nucleus The nucleus was usually round occasionally oval and possessed a well defined limiting membrane.

Progressive anemia was extremely common. White blood cell counts were for the most part normal An important

diagnostic aid was the presence of myeloma cells in the peripheral blood (Fig 93)

Of 47 patients with multiple osseous involvement, 34 (72%) had elevated serum globulin levels whereas total protein levels were elevated above normal in only 27 (57%) Of 53 patients with multiple bone involvement 17 showed Bence Jones protein in the urine.

In only one instance did autopsy disclose amyloid deposits



Fig 94—Apparent solitary lesion which developed in tibia fter treatment of epiglottic lesion (Courtesy of Carson, C. I *et al* Am. J Clin. Path. 25 849-888, August, 1955)

The deposits occurred in the endocardium the wall of the urinary bladder and the adrenal gland

Multiple myeloma produces purely osteolytic lesions of bone and hypercalcemia apparently indicates this lytic resorption Of 36 patients with diffuse involvement of bone 14 had serum calcium levels above 12 mg /100 ml.

Of the 18 patients with solitary bone lesions 9 had involvement of a single vertebra and 3 of the sacrum In patients with apparent solitary lesions the usual laboratory examinations were not remarkable

In nine patients extramedullary plasma cell tumors arose

primarily from the upper respiratory tract or mouth In one seven months after a plasma cell tumor was removed from the epiglottis x rays revealed a solitary tumor in the upper third of the left tibia (Fig 94)

The punched-out lesions of myeloma are purely osteolytic. X ray evidence of new bone formation or periosteal reaction suggests that the process is other than myeloma

X ray therapy may control localized lesions well and may even eradicate them Of the chemical agents available, the best seems to be urethane either alone or with ACTH or cortisone. Toxic effects may be severe

Osteogenic Sarcoma Arising in Polyostotic Fibrous Dysplasia Report of Case Neil G Perkinson and Norman L. Higinbotham[5] (Memorial Center for Cancer New York) present a case of sarcoma arising in more than one area of fibrous dysplasia

Man, 20 noted onset of deafness of his right ear several years before his present hospitalization. At that time the x ray diagnosis of "Paget s disease of the skull" had been made. Later he noticed increasing shortening of the lower right leg and difficulty in walking He also had a rib removed the pathologic study of which was said to have revealed Paget s disease

Physical examination revealed a diffuse swelling of the right frontal bone. The upper inner portion of the right scapula was enlarged. Shortening of the right femur was noted. Serum calcium level was 11.8 mg / 100 ml., serum phosphorus 2.78 mg./100 ml. and serum alkaline phosphatase 19.3 units/100 ml

X ray examination revealed thickening of the calvarium, involving mainly the outer table with irregular cystlike areas the right half of the sacrum and pelvis, right femur tibia and fibula revealed similar changes. The femur showed a coxa vara deformity with marked widening of the shaft.

Review of previous x rays and biopsy specimens showed this process to be polyostotic fibrous dysplasia rather than Paget s disease and, because of the patient s complaint of pain in the right hip a course of deep x ray therapy was given. This relieved the pain for a short interval but blood chemistry remained unchanged.

Severe pain in the right femoral area developed 18 months later X rays showed no significant changes. Cortical excision and curettage of the right subtrochanteric area revealed fibrous dysplasia.

About two years later he sustained a pathologic fracture trans-

(5) Cancer 8:396-402, Mar Apr., 1955

versely through the right femur This responded well to simple traction followed by body spica. Five years later aspiration biopsy of the upper third of the right femur revealed osteogenic sarcoma. A right hip disarticulation was performed and the removed tissue showed osteogenic sarcoma and fibrous dysplasia of the femur and tibia and fibrous dysplasia of fibula and most of the tarsal bones.

Though the patient had x ray treatment, it is not felt that this condition represents a postirradiation sarcoma because the time interval was short and the tibial lesion that became sarcomatous received no irradiation

Biophysical Effects of Ultrasonic Energy on Carcinoma and Their Possible Significance is discussed by Justus F Lehmann and Frank H Krusen[6] (Mayo Clinic and Found) who found that ultrasonic energy caused destructive phenomena of cavitation only sporadically in solid tumors Occurrence of cavitation was largely inhibited by the high volume percentage of cells in the tissues

To the authors it seems unlikely that the heating effect of ultrasonic energy can destroy cancerous growths without destruction of normal tissues However combined with x ray therapy ultrasonic treatment appears to increase the efficiency of the former It is conceivable that this property of ultrasonic energy may be of practical value

The fact that the effects of ultrasonic energy were not at all uniform because of the nonuniformity of the intensity in the sound field and the fact that the increase in efficiency of x ray treatments was not a major one indicate the limitations of possible therapeutic application of ultrasonic energy in combination with x ray irradiation. However it is conceivable that these limiting factors can be improved by changing the experimental conditions

There is no definite indication that ultrasonic energy will have a place in the therapy of cancer

Use of Ultrasonic Vibration in Treatment of Pain Arising from Phantom Limbs Scars and Neuromas Preliminary Report. David Rubin and John H Kuitert[7] (Brooke Army Hosp Fort Sam Houston Tex.) attempted to determine the effect of ultrasound vibrations in intensities of 1 w/cm² applied for short periods daily Of 35 patients only 3 failed

(6) Arch. Phys. Med. 36:452-459 July 1955.
(7) Ibid., pp. 445-452.

to respond favorably to this form of treatment While adequate follow up studies have not been possible the good response reported by the patients and evidenced by a decrease or disappearance of objective tenderness at the painful site in the cases of neuroma and scar pain and of phantom pain support the contention that this modality has pain relieving qualities in such conditions

The mode of action is subject to speculation However in the absence of histopathologic findings such as necrosis cellular infiltration and other specific pathologic change a mechanical alteration in the peripheral tissues is indicated This may perhaps be induced by vigorous micromassage of the peripheral receptors reducing or eliminating the abnormal sensations perceived as pain Further support is given to the theory that the basis of phantom pain resides in abnormal peripheral stimuli rather than in purely psychologic phenomena by the observation that there is progressive loss of phantom pain as a result of ultrasound application to the painful peripheral part when phantom pain is combined with stump or scar pain In such cases pressure over some portion of the distal stump or scar before treatment was reported by the patient to aggravate the phantom pain and was referred to a portion of the missing part.

Principles of Supervoltage (2 Million Volts) Rotation Therapy Illustrated by Treatment of a Chordoma of the Vertebra. Rotation technics with supervoltage x rays permit homogeneous irradiation of a tumor with high dosage while the volume dose to normal tissues remains small As a result, it is possible to deliver with safety lethal tumor doses to certain deep-seated neoplasms which could not be efficiently irradiated with the use of conventional technics In the supervoltage range of 2 22 Mev the dose distribution in the tumor and the adjacent normal tissues is independent of voltage when small fields are employed For large fields the higher voltage decreases slightly the volume dose to the normal tissues while the doses to the tumor region remain the same.

The right angle co-ordinate system" for positioning the tumor at the center of rotation is an accurate and easily reproducible method for precision irradiation. It requires a

horizontal contour meter a rotating platform with two perpendicular traverses and a special pointer Radiographic corroboration with the treatment beam is employed wherever feasible. Variations of the basic supervoltage rotation principles have been successfully employed for treatment of subsurface lesions particularly tumors of the head and neck.

The usefulness of supervoltage rotation therapy is well demonstrated in the following case where Milton Friedman, Gerald J Hine and Joseph Dresner[8] (Hosp for Joint Diseases New York) had the therapeutic problem of delivering a large tumor lethal dose of radiation (approximately 7 000 r) to a deep-seated lesion which lay not only near the center of the torso but also close to the cauda equina

Man 44 had a 4 cm chordoma lying 1 cm. from the cauda equina, the tolerance dose for which is 5 000 r in five to eight weeks. The anterior border of the tumor was 3 cm. from the intestines whose tolerance dose is 4,500 r in a like period It was deemed necessary to deliver to this tumor a dose of approximately 7 000 r Within about 6½ weeks 26 x ray treatments were given with a 2 Mev resonant transformer generator With rotation technic a tumor dose of 7,200 r was delivered in 47 days to a cylindric volume of tissue measuring 6 cm. in diameter and 6 cm. high, which encompassed the tumor The dose to the spinal cord ranged from 3,800 to 4 400 r At the end of the treatment the pain had disappeared. Radiographic examination one month later showed healing sclerosis of the lesion and restoration of normal contour of the body of the vertebra There was no erythema of the skin and no evidence of spinal cord damage two years after irradiation.

(8) Radiology 64 1 16 January 1955

ARTHRITIS AND RHEUMATISM

Anemia of Rheumatoid Arthritis was studied by Franklin G Ebaugh Jr., Ralph E. Peterson, Gerald P Rodnan and Joseph J Bunim[9] (Nat'l Inst of Health) Not all patients with active rheumatoid arthritis have anemia. When it occurs it usually is moderate, with hematocrit values of about 30-35 ml/100 ml Red cells are usually normocytic and slightly hypochromic. The reticulocytes are within normal limits when correction is made for anemia. Serum iron concentration is low but iron binding protein is within normal limits Despite low serum iron concentration and hypochromia of the red cells there is no evidence of decrease in total body iron or actual iron deficiency In contrast to patients with iron deficiency anemia anemia of rheumatoid arthritis does not respond to iron administered either orally or intravenously and thus there is no convincing indication for iron administration in patients with rheumatoid arthritis

Period of survival of red blood cells was slightly below accepted normal value of 120 days degree of hemolysis varying greatly from patient to patient Principal cause for anemia in some patients appeared to be not so much increased hemolysis as failure of bone marrow to respond adequately to stress of anemia though most patients presented a combination of these two disturbances

Of the various forms of therapy only cortisone appeared to have any definite effect Iron therapy liver extract vitamin B_{12} and folic acid are not of proved benefit.

Joint Fluid Changes in Rheumatoid Arthritis were studied by William D Robinson Ivan F Duff and Elizabeth M Smith[1] (Univ of Michigan) who found that the abnormal characteristics of the synovial fluid in rheumatoid arthritis revert toward a more normal pattern under the influence of adrenocortical steroids With systemic therapy by adrenocortical stimulation or oral or intramuscular administration of cortisone or hydrocortisone, these effects were

(9) M. Clin. North America 39 489-498 March, 1955
(1) J Michigan M. Soc. 54:270-291 March, 1955

most definite at high dosage levels After cortisone given intra articularly these effects were not obtained consistently and lasted only a few days After hydrocortisone intra articularly, *such effects were more consistently obtained* with small doses and were better sustained Apparently this effect of the steroids is exerted on the synovial membrane and may account in part for the favorable clinical effect of these agents in rheumatoid arthritis

Besides a decrease in polymorphonuclear cells reversion toward normal includes increase in joint fluid viscosity attributable to improvement in the physical chemical properties of the polysaccharide characteristic of synovial fluid hyaluronic acid Such changes indicate an effect of the steroids on connective tissue cells where hyaluronic acid is presumably formed These studies do not indicate whether the effect of the steroids at the connective tissue level is direct or secondary to suppression of inflammation

Hydrocortisone acetate intra articularly is not suitable as a single form of treatment but must be combined with other forms of therapy When this was done in selected patients with one or two joints refractory to other forms of treatment intra articular injections of hydrocortisone were associated with sustained worthwhile benefit in 50% of the joints treated When combined with special orthopedic and physical therapy measures the procedure was a definite asset in rehabilitation of selected individuals In some joints worthwhile symptomatic and objective relief were achieved for four to six weeks before repeat injections were required On discontinuation of therapy symptomatic benefit lasted 4-18 months in 19% of all treated joints In the others injections were eventually discontinued because of lack of benefit or inadequate response

Studies on Metabolism of Adrenal Cortical Steroids in Synovial Cavity in Rheumatoid Arthritis Currier McEwen[2] (New York Univ) injected 50 or 100 mg cortisone free alcohol or hydrocortisone intra articularly into the knee joint after a definite time interval all the fluid was aspirated and the joint cavity washed several times with saline The combined fluid and washings was then analyzed for corticoster

(2) Tr A. Am. Physicians 67 97 102, 1954

oids Fluid from the treated contralateral knee was analyzed as a control

McEwen found that both cortisone and hydrocortisone disappear rapidly from the synovial fluid after injection however metabolites probably are formed locally in the joint. This study suggested the possibility that the locally acting anti inflammatory agent may be one of these metabolites rather than hydrocortisone itself or that a metabolite may share anti inflammatory activity Further investigation disclosed that one metabolite does possess biologic activity

Problems in Management of Rheumatoid Arthritis Sel van Davison[3] treated 14 patients 10 of whom received systemic corticosteroids at some time. Of the 10 1 eventually was maintained on hydrocortisone intra articularly Two patients were successfully treated solely with hydrocortisone by this route. No patient had to discontinue cortisone permanently because of untoward side effects

Eight patients received chrysotherapy Treatment was ineffective in four Twice, treatment was stopped because of gold toxicity In one case improvement was distinct but insufficient for the patient s needs and cortisone was substituted with good effect Chrysotherapy alone apparently established a complete remission in one patient

When rheumatoid arthritis is mild and not very progressive, attention to general health physiotherapy and adequate analgesic drugs usually suffices In the presence of early active, progressive disease particularly in the younger patient, gold may be tried. Even in the older patient, salutory effects have been observed. BAL and the corticosteroids have markedly diminished the consequences of gold toxicity

If chrysotherapy is unsuccessful or is losing its effectiveness corticosteroids are recommended. They are most rehabilitating in chronic rheumatoid arthritis with deformities and ankylosis

To be effective, lowering of the cortisone dosage must be done slowly Decreasing the dose by 5 mg every two to three weeks obviates withdrawal effects and explosive relapses

When one or two joints are severely affected and others

(3) J Mt. Sinai Hosp. 21 165-175 Nov Dec., 1954

slightly or not at all hydrocortisone intra articularly is very effective Repeating these injections at necessary intervals allows much smaller systemic doses

Analgesic drugs mainly salicylates should be pushed to the point of tolerance When indicated codeine in small amounts may be added A high level of aspirin dosage rather than cortisone is preferred.

No additional benefit was noted in patients treated simultaneously with gold and cortisone and hydrocortisone systemically was no more effective than cortisone. Adrenal corticotrophic hormones (ACTH) were not employed because of the expense and nuisance of frequent injections The use of a gel obviates the need for daily aqueous injections but in the event of overdose and reactions it cannot be withdrawn and controlled as can the oral corticosteroids

Treatment of Rheumatoid Arthritis with Cortisone Two to Four Year Studies on 50 patients (35 women) aged 30-50 are reported by Kai Bent Hansen Finn Fischer and Knud Brøchner Mortensen[4] (Univ of Copenhagen) In all, the disease was active and progressive with severe cases preponderating The duration of illness was 3 months to 22 years average 6 years All the patients had been treated previously the majority with gold. Cortisone treatment was discontinued because of unsatisfactory response in eight of complications in eight and after remission in three In 31 treatment was continued 20-52 months Only 2 patients could work before treatment while 16 were working at time of analysis In 19 patients 17 ketosteroid excretion after ACTH following uninterrupted treatment (average 27 months) with 62 5-75 mg cortisone daily showed a significant increase averaging 420% of the excretion during cortisone therapy and 250% of the pretreatment value.

In far advanced cases and in elderly patients with coronary sclerosis and osteoporosis caution should be exercised in instituting treatment Contraindications include active infections hypertension cardiac and renal insufficiency gastric ulcer mental instability and perhaps diabetes The maintenance dose should be based on the patient s tolerance rather than on complete suppression of symptoms Control

(4) Acta rheumat scandinav 1 7 21 1955

examinations should be made during treatment and cortisone should always be discontinued gradually In case of infection or trauma cortisone must not be discontinued the dose often should be increased by 50-150% or even more. If intestinal resorption is impaired parenteral administration is necessary If complication appears during the first months after the termination of therapy it may be advisable to resume the hormone. Considerable cortisone must be given before during and after any operation performed during or just after a course of treatment If symptoms of cortical insufficiency appear treatment should be the same as in addisonian crisis intravenous 17 hydroxycorticosterone may be necessary Despite the risk of complications cortisone should be employed in properly selected cases of rheumatoid arthritis when other treatment is without effect

Cortisone ACTH and Phenylbutazone in Long Term Therapy of Rheumatoid Arthritis. W Paul Holbrook[5] (Tucson Ariz.) reports four year results in treatment. Acute early rheumatoid arthritis and rheumatoid spondylitis showed a high failure rate when treated with maximal safe doses of cortisone or ACTH only about 5% of the patients holding worthwhile improvement at the end of four years Patients with older and less acute disease when treated with minimal doses of ACTH and cortisone showed much less rapid failure rate about 43% maintaining worthwhile improvement at the end of four years The failure rate of phenylbutazone (butazolidin®) in peripheral rheumatoid arthritis after the first six months was less rapid than for cortisone and ACTH but still fairly high Phenylbutazone showed a dramatically low failure rate in rheumatoid spondylitis and is the drug of choice in this disease. Its results were much superior to those secured with x ray therapy

Active rheumatoid arthritis can neither be kept suppressed nor prevented from progression with ACTH and cortisone as demonstrated by the high failure rates The outcome conceivably might have been better without treatment as there was occasional occurrence of spontaneous remissions Absence of long term remissions in this series

(5) M. Clin. North America 39 405-412 March, 1955

suggests that cortisone and ACTH may in some fashion interfere with the normal processes of immunity or repair

Evaluation of Prolonged Cortisone Therapy in Rheumatoid Arthritis Four Year Study is reported by Joseph J Bunim Morris Ziff and Currier McEwen[6] (New York Univ) Of the 78 patients studied 9 had juvenile arthritis 9 psoriasis 7 spondylitis and 15 subcutaneous nodules. About one half had advanced rheumatoid arthritis about one fourth were in the early reversible phase with no erosion of cartilage or destruction of bone by x ray and the others were in the intermediate stage Average daily maintenance doses of cortisone were 25 50 mg for 18 patients, 60-75 mg for 21 patients 80-100 mg for 22 and over 100 mg for 3 In each of the last three patients a gastric or duodenal ulcer developed and two of the ulcers perforated

Of 71 patients treated six weeks or longer 16 were considered in remission 20 were improved to a major degree, 31 were only slightly improved and 4 did not improve or were worse The number and percentage of patients who had remissions increased as treatment was extended beyond six months Most patients showed complete remissions or major improvement The most striking response was observed in those who had had arthritis for 1 year or less and the least favorable in those who had it over 10 years Of 17 patients who were bedridden before cortisone therapy 13 could walk without aid 2 required a cane crutch or wheelchair and only 2 remained bedridden Of 31 patients who were incapacitated and unable to care for personal needs 25 became self sufficient after cortisone was administered The erythrocyte sedimentation rate became normal in 10 of 14 patients in remission Subcutaneous nodules present before therapy usually did not disappear In two patients nodules developed for the first time during cortisone therapy and in eight with nodules before treatment new ones developed Serial x rays of involved joints of 20 patients showed some destruction of the subchondral bone before therapy in 14 during therapy the areas of destruction increased in 8 remained unchanged in 5 and diminished in 1 Of six with no pre-existing osseous damage on x ray all showed areas of destruction during therapy

(6) Am J Med 18 27-40 January 1955

Patients most suitable for cortisone therapy are those whose disease is severe reversible of relatively recent onset and of rapidly progressive relentless course. Failure to alter or arrest the course frequent relapses when the drug is discontinued and occasional development of serious complications limit the benefits of steroid therapy

Corticotropin Intravenous Infusion Therapy in Rheumatic Conditions. J W Beattie and S J Hartfall[7] (Univ of Leeds) observed from August 1951 to October 1953 425 patients who received corticotropin in conjunction with general supportive, physical and rehabilitative therapy The conditions treated included rheumatoid arthritis 329 patients (90 men 239 women) psoriatic arthropathy 4 women ankylosing spondylitis 13 (7 men 6 women) and osteoarthritis 48 (4 men 44 women)

There was no doubt regarding the beneficial effect of the intravenous infusion therapy In the rheumatoid arthritis group 89% improved with restoration to complete functional capacity in 15% Improvement was greatest when the disease had been present for less than one year with a gradual decline as the duration increased However a further marked rise in improvement occurred in cases of over 15 years duration This effect may be related to the possibility that the disease at this time tends to be burned out and that pain soft tissue stiffness and apathy may be the cause of poor functional capacity On the other hand all age groups showed fairly comparable improvement

The more prolonged infusions (18-24 hours) were most effective, with no indication for more than 20-25 mg per infusion or for concentrations greater than 0.9 mg/hour The maximal effect was gained by the first few infusions and a three to six day interval between infusions was satisfactory

The procedure is safe economical and free from such side effects as hypercorticism sodium retention or permanent disturbance of carbohydrate metabolism

Intra-articular Hydrocortisone in Rheumatoid Arthritis Clinical and Laboratory Studies. Ivan F Duff William D Robinson William M Mikkelsen and Noel H Chatelin[8]

(7) Brit. M. J 1 1494-1499 June 25 1955
(8) M. Clin. North America 39 413-437 March, 1955

(Univ of Michigan) made repeated injections of hydrocortisone into 105 joints of 60 patients aged 12-82 Only patients with active synovitis were included in this study but there was no restriction as to extent or progression of joint involvement duration of disease or degree of impairment of function The treatment proved a worthwhile addition to the program in 50% of the patients On discontinuing injections symptomatic benefit persisted from 4 to 18 months in 19% of all treated joints Intra articular therapy eliminates some of the dangers of long term systemic administration of ACTH cortisone or hydrocortisone, because of the much smaller total dosage involved

Changes in synovial fluid following intra articular injection of hydrocortisone were generally a reversal toward more normal characteristics Often a cumulative effect in synovial fluid findings was apparent after repeated injections Remission in the activity of the rheumatoid process occurred in 7 of 60 patients In these patients the joint fluid characteristics closely approached normal values Remission coincided not only with intra articular injections of steroid but also in four patients with chrysotherapy

Because the intra articular use of hydrocortisone is local treatment it is not practical in the patient with extensive multiple joint involvement In patients in whom treatment every one to two weeks does not produce satisfactory improvement injections at intervals of three to four days for one or two weeks may produce cumulative benefit Control of the rheumatoid process in joints treated with hydrocortisone may be associated with progression of the disease to other joints

No joint infections nor allergic reactions were observed. This treatment represents an addition to not a substitute for sound management with emphasis on adequate rest, analgesics maintenance of joint function and attention to the general health of each patient

Treatment of Experimental Arthritis in Rabbits with Hydrocortisone Acetate R H Ramsey and J Albert Key[9] (St. Louis) produced a mild inflammatory reaction in knee joints of rabbits by injecting into each joint a suspension of a 10%

(9) J Bone & Joint Surg 37 A 354-360 April, 1955.

solution of oil of turpentine in water or of talc in water The left knees served as controls and right knees were treated by intra articular injections of hydrocortisone

Inflammatory response was well under way before hydrocortisone was given Arthritis caused by turpentine and the granulomatous process by which the talc was isolated from the joint cavity continued to progress Grossly there was diminution of the vascular dilatation element of inflammation and microscopically fewer infiltrating phagocytic cells on the treated side, in most instances These findings suggest not only that there *is inhibition of the inflammatory* response but also that tissues tend to return to normal Hydrocortisone seemed to exert a favorable influence on recovery although the difference between treated and untreated sides was not great

The authors suggest that hydrocortisone would be most useful in pathologic conditions which are inherently localized and self limited in which the symptoms are largely due to the inflammatory response per se and which are either progressing or in which the noxious agent is continuing to act

Multiarticular Injections of Hydrocortisone in Treatment of Chronic Progressive Polyarthritis are recommended by R Weismann Netter B Krewer and Pierre Lorch[1] (Paris) on the basis of experience in 36 patients despite majority opinion that such treatment should be reserved for mono- or oligoarticular lesions General anesthesia was used in a third of the patients and is recommended in all requiring injection of many (20-50) joints and for some nervous fearful patients to relieve pain accompanying treatment of finger wrist or elbow joints In some patients two doses of sedative 3½ hours before, are sufficient Often especially in out patients treatment of numerous joints is carried out without anesthesia by a series of injections Aseptic technic and penicillin prophylaxis are used.

Among hundreds of articular injections local infection developed following only two—in a knee and a shoulder The latter required minimal arthrotomy with lavage of synovial membrane Dose of hydrocortisone injected depends on size

(1) Presse méd. 63 1153-1155 Sept. 3 1955

of joint for knee hip or shoulder 5 cc (125 mg) for an wrist elbow, 3-4 cc., and for small distal joints 1 2 cc. In single procedure 2 2 5 Gm may be given without any toward effect Absence of generalized diffusion of the hormone is demonstrated by negative response to the Thorn test No changes in blood cells carbohydrates electrolytes or 17-corticosteroids were observed in patients who received this treatment Resorption from the joint eventually occurs but is extremely slow Total resorption corresponds to return of symptoms

Lack of side effects makes this treatment preferable to general administration of the hormone in many cases It is particularly valuable in treatment of moderately severe cases because pain is relieved and joints are rendered more mobile. Duration of the effect varies from six weeks to a year the average being four months In eight patients remission lasted over 10 months in two 1 year When symptoms recur injections can be repeated with remissions of the same duration In some patients it may be advantageous to alternate the intra articular injections with courses of hydrocortisone by mouth

Clinical Evaluation of Meticorten in Rheumatoid Arthritis and Allied Conditions was made by John W Gray and Evelyn Z Merrick[3] (Newark N J) on 57 patients aged 31 64 including 44 with rheumatoid arthritis 3 with rheumatoid spondylitis and 10 with nonrheumatoid disorders The dosages of meticorten (prednisone) most successfully used were as follows If total daily requirement was 30 mg 5 mg was given every three hours during the day if 25 mg., 5 mg every four hours if 20 mg 5 mg after meals and at bedtime, and if 10 mg 5 mg after breakfast and 5 mg after the evening meal Individual adjustments influenced the size of the dose and rate of increase or reduction in dosage.

Many patients in the rheumatoid group had improved with other treatment but retained some periarticular swelling and thickening which interfered with functional capacity Of these patients 20 showed major improvement during meticorten therapy and 19 had complete reversal Elevated sedimentation rates became normal in most cases within a week

(2) J Am Geriat Soc 3 337 344 May 1955

The patients reported a feeling of well being and increased initiative 24 hours after the drug was started Pain and stiffness in the joints were relieved in one to seven days and reduction of swelling and tenderness followed Pain was relieved in the three patients with rheumatoid spondylitis Postural improvement was noted in the two patients with fibrous ankylosis but there was no improvement in one with bony akylosis Meticorten relieved pain and cleared a persistent skin rash but had little effect on the profound weakness of the patient with dermatomyositis Prompt complete remission of a subacute persistent attack of gouty arthritis occurred In the four cases of osteoarthritis one of torticollis and one of bursitis pain was promptly relieved.

Side effects were comparatively infrequent and minor Mild insomnia and nervousness and digestive disturbances tended to decrease and disappear in many cases as the drug was reduced Body weight tended to be steady or to show a slight decrease. No impairment of water balance was noted. Urination increased in both frequency and volume during the first 7 10 days Heart consciousness palpitation breathlessness and precordial oppression occurred but in only one patient was it severe enough to stop treatment.

Metacortandracin and 9 Alpha Fluorohydrocortisone Acetate in Rheumatic Diseases were studied by L Villa C B Ballabio and G Sala[3] (Univ of Milan) in 36 patients

METHOD —Both steroids were administered orally Initial suppressive doses were gradually reduced to the minimal maintenance dose Initial dose was 30-50 mg for metacortandracin (prednisone) and 8-16 mg for 9-α fluorohydrocortisone. Maintenance doses varied widely from case to case. Duration of treatment was determined by the clinical course.

The authors found that the antirheumatic activity of metacortandracin and 9-α fluorohydrocortisone is 3-5 and 8-10 times greater respectively than cortisone.

Metacortandracin does not interfere with salt and water balance glucose tolerance and insulin sensitivity are decreased pre-existing diabetes is aggravated 9-α-Fluorohydrocortisone increases sodium reabsorption and potassium excretion and increases both extracellular and intracellular

(3) Ann. Rheumat. Dis. 14.251-258, September 1955

fluids Serum potassium levels are much reduced, sodium values slightly increased and hematocrit values reduced. The increased effect of 9-α fluorohydrocortisone on electrolytes lessens its usefulness in treatment of rheumatic diseases.

Both steroids cause hypercorticoidism and inhibit adrenal function metacortandracin decreases the numbers of circulating eosinophils.

In an addendum the authors state that 67 additional patients were treated with metacortandracin or metacortandralone (prednisolone) with results confirming the first study They emphasize the possibility of deterioration of the patient on withdrawal of the drugs. In three patients in whom this was observed urinary excretion of 17 ketosteroids was lowered and relapses may have been due to inhibition of adrenal function

Studies on Metacortandralone and Metacortandracin in Rheumatoid Arthritis Antirheumatic Potency Metabolic Effects and Hormonal Properties Joseph J Bunim Maurice M Pechet and Alfred J Bollet[4] (Nat'l Inst. of Health) studied the clinical effects of the steroids metacortandralone [prednisolone] in seven patients with rheumatoid arthritis. Three had previously taken adequate doses of salicylates but no steroids The other four had received besides aspirin, cortisone, hydrocortisone corticotropin gold compounds phenylbutazone or oxytetracycline without benefit Duration of the arthritis ranged from 2⅓ to 25 years the stage from 1 to 4 and the functional classification from class 1 to 4 Supplementary potassium salts were unnecessary The dosage ranged from 30 to 60 mg daily generally divided into three parts and given at intervals of eight hours This dose was maintained for no longer than 14 days then decreased in decrements of 5-10 mg every 4 or 5 days until signs or symptoms recurred The maintenance dose varied with the severity of the arthritis and ranged from 5 to 25 mg daily

Although no patient was aware of a change in medication each patient noted symptomatic improvement on the same day the active agent was substituted for a placebo Some objective improvement was noted at the end of the first day in most patients It did not attain a peak until after two or three

(4) J.A.M.A. 157 311 318, Jan. 22 1955

weeks of therapy Periarticular swelling and effusions in the joints receded more slowly than the other signs Biopsies of the synovium of the knee joint in three patients revealed a striking subsidence of inflammation The most significant change was disappearance of 'fibrinoid alteration in two of the three patients Two patients who were febrile became afebrile on the first day of metacortandralone therapy The erythrocyte sedimentation rate elevated in all patients decreased significantly and promptly in every instance during treatment reaching normal or nearly normal levels The C reactive protein present in all patients before treatment disappeared with suppressive doses of the steroid and reappeared in several patients when the dose was reduced The sensitized sheep cell agglutination reaction was present in six of the seven patients before therapy and remained unchanged during therapy Side effects were not serious and disappeared as the dose was reduced The commonest symptom was increased appetite There was no sodium retention or potassium or nitrogen loss and no change in blood sugar A decrease in circulating eosinophils and urinary 17 ketosteroids occurred within two days of metacortandralone administration

Metacortandralone is about three to four times more potent as an antirheumatic and anti inflammatory agent than cortisone and two to three times more potent than hydrocortisone Since there was no proportionate increase in the frequency or severity of undesirable side effects the new steroid possesses an augmented therapeutic ratio

Metacortandracin [prednisone] was given to five patients with rheumatoid arthritis three of whom had received metacortandralone previously Preliminary studies indicate that the antirheumatic potency and hormonal effect of these two steroids is similar

Since this article was prepared additional observations were made. After several months of administration the maintenance dose of the new steroids had to be increased in a few cases to maintain the initial improvement. Administration every six hours seems more desirable than every eight hours

Glycine Metabolism in Rheumatoid Arthritis and Allied Diseases. Most of the cellular and extracellular body proteins

contain a wide spectrum of amino acids with each amino acid contributing only a few per cent to the mass of the protein However, glycine and proline contribute two thirds of all amino acid residues to the molecule of collagen and elastin The small size of these amino acids probably permits a "tighter molecular structure which gives collagen and elastin the tensile strength and elasticity required for the stability of movable joints and the integrity of skin

Henry M Lemon Joseph M Looney and William H Chasen[5] (Boston Univ) attempted to determine whether any detectable disturbance existed in glycine or proline metabolism in patients with rheumatic disorders compared with patients with other diseases and with normal persons To study the former an adaptation was devised of the intravenous hippuric acid synthesis test of Quick in which benzoic acid is detoxified by conjugation with glycine.

In studying the response of serum glycine to sodium benzoate administered to 259 patients with nonrheumatoid disease rheumatoid arthritis and allied disorders affecting collagen statistically significant differences were demonstrated in the rheumatoid and nonrheumatoid groups These can be interpreted best as indicative of reduced reservoirs of readily available glycine in the rheumatoid state particularly when clinically active disease is present. Similar correlations were lacking for serum alanine response, hippuric acid excretion or laboratory tests of hepatic and renal function Since collagen and elastin contain 3-10 times more glycine than any other body protein the total body requirements for this amino acid will be most readily altered by diseases affecting the rate of synthesis of connective tissues Abnormal glycine metabolism is also demonstrable at times in active rheumatic fever scleroderma and lupus erythematosus disseminatus

The authors experience with dietary supplements of glycine in rheumatoid patients has been disappointing

As yet, it is not possible to decide whether the present observations indicate a primary or a secondary role for disordered glycine metabolism in the pathogenesis of rheumatic disorders

(5) Rheumatism 2 48-61, July 1955.

Natural History of Pigmented Villonodular Synovitis of Tendon Sheaths is described by J B Sherry and W Anderson[6] (Univ of Toronto) whose study of 34 cases of tendon tumors and a smaller group of more extensive lesions of knee joints demonstrated the relationship between the two Twenty six of the tendon tumors were in women age range was 18-70 The lesion was in the hand in 31 (in fingers in 30) Three were in the foot, two of them in the ankle region A small painless lump or swelling of several months or years' duration was the usual complaint. One mass had undergone recent rapid enlargement, and another caused pain on certain hand movements There was no complaint of restricted movement Pigmented villonodular tenosynovitis was diagnosed clinically in only five cases Nine of 12 patients were free from recurrence one to six years after removal Three had recurrences after three or four years one of whom was free from the lesion three years after a second operation

Grossly the finger lesions were encapsulated firm fibrous often lobulated nodules rarely exceeding 2-3 cm in diameter The cut surface varied from grayish white through yellow to deep reddish brown Fine trabeculations originated from the capsule and transected the mass in a roughly radiating pattern The synovectomy specimens exhibited a wide range of changes starting with thickening and pigmentation and progressing through granularity to eventual papillary formation. The papillae became shorter and more blunted and finally fused to form a lobulated mass generally indistinguishable from those arising from tendon sheaths The variation in gross appearance of the two lesions may be related to their different physical environments

The earliest microscopic change in the knee joint was thickening of synovial membrane from piling up of cells of the lining many cells contained pigment, and focal collections of rounded and polyhedral cells were common With progression proliferation of synovial tissues formed villous processes covered by a prominent layer of synovial cells and with a stroma of loose connective tissue also containing pigment The villi tended to fuse to form clefts and nodules at first microscopic but later grossly visible The earliest

(6) J Bone & Joint Surg 37 A 1005-1011 October 1955

changes were rarely seen in tendon sheath lesions but from the stage of fusion of villi the subsequent course was identical with that in knee joint lesions Fusion and enlargement of nodules resulted in formation of an incomplete compression capsule in tenosynovial tissues into which the lesion extended Pigment-containing macrophages probably originally present in a single villus were commonly found in



Fig 95.—Pigment-filled macrophages in tendon sheath lesion; ×160 (Courtesy of Sherry J B and Anderson, W J Bone & Joint Surg 37 A 1005-1011 October 1955)

focal collections scattered irregularly throughout the nodule (Fig 95) In the fully developed cellular stage the lesion was a complex mixture of giant cells pigment laden macrophages foam cells and occasional synovium lined clefts embedded in a stroma of polygonal or rounded cells incompletely encapsulated by a layer of connective tissue. During late stage cellular elements were gradually replaced by connective tissue subsequently hyalinized with remaining nests of cells especially small giant cells and synovium lined clefts. Degenerative changes e g cholesterol clefts also occurred

Temporomandibular Joint Disease Abnormal Mandibular Function as Basis Roger G Gerry and Robert L. Rowan[7] (U S Naval Hosp St. Albans N Y) claim that the commonest types of temporomandibular complaints are those

(7) A M.A. Arch. Surg 69 635-645 November 1954

which are secondary to trauma or caused by abnormal movements of the mandibular condyle

The most frequent traumatic problem of the temporomandibular joint is undisplaced fracture of the condylar neck but a more serious problem is fracture-dislocation Forward tilting of the condylar fragment into the infratemporal fossa is usually present and owing to the soft tissue injury considerable articular and periarticular scarring occurs Many symptoms in the temporomandibular joint do not appear until some time after the condylar fracture has healed completely The symptoms do not present in the joint that has been injured, but actually in the contralateral joint and they have as their basis the periarticular scarring following trauma and the anterior displacement of the condyle or both Since the joint with the intact condyle is doing the job of both joints chronic hypermotility symptoms will eventuate If equivalent injury of the mandibular condyles occurs bilaterally there is no need for concern about the development of the fracture condylar syndrome.

The disk of the mandibular joint moves as a unit with the mandibular condyle when the intimate arrangement between disk and condyle is interrupted disk derangement ensues Whenever condylar excursion exceeds the range of normal articular contact hypermotility exists

Most patients present themselves during an episode of pain in one or both temporomandibular joints The pain which may have followed a loud "pop is accompanied by acute dislocation which the patient reduced manually or which was reduced by a dentist or physician The acute disk derangement or "pop may not have recurred since the initial episode but the patient very often has symptoms of pain and limitation of excursion

There is deviation of the mandible toward the painful joint on opening unless both joints are involved Occasionally there is no pain at all and the patient presents himself because the clicking' is annoying and his jaw "sticks The pain, when present results from acute strain and should be treated with limitation of motion and use of local heat and salicylates Active immobilization is indicated only in severe cases

After the acute pain has subsided roentgenograms should

be taken of both joints at the maximum incisal opening The size of the opening should be recorded so that the degree of condylar hypermotility can be followed

In accordance with the concept that hypermotility has, as its physiopathologic basis an increased external pterygoid muscle capacity the authors have attempted to treat the problem with a direct approach reasoning that, if a normal condylar excursion can be maintained concurrent disk derangement will ultimately repair itself In treating patients with bicondylar hypermotility they attempted to develop the capacity of the suprahyoid muscles which are antagonist to the external pterygoids with the following exercise

TREATMENT —The resistive load is applied by use of a weight attached to a cord which is passed over a single pulley This cord is then fastened to the handle of a lower impression tray which is attached to the lower teeth by means of impression compound. The initial resistive load should be 3 lb. This is progressively increased up to 15 lb During the exercise period care must be taken to see that the weight is being properly used. Mandibular protrusion should be accomplished with the aid of a technician. For good results, this exercise should be conducted twice a day for 10 minutes.

In patients who have had repeated episodes of acute dislocation and chronic hypermotility symptomatic treatment with diathermy salicylates and injections of anesthetic agents produce excellent results

Femoral Head in the Aged Studies of Senile Transformations and of Their Relation to Osteoarthritis of Hip P C Veraguth[8] (Univ of Geneva) in a study of the heads of 7? femurs of persons of varying ages without articular disturbances found that the femoral head of the aged shows primarily atrophy of all its structures Senile osteoporosis is most striking in the parts of minor functional significance The weight bearing system remains well developed and becomes more and more marked this may be demonstrated radiologically Histologically there is a larger proportion of necrotized osteocytes than in young persons Where osteocytic necrobiosis prevails bony tissue undergoes creeping substitution

In addition to these changes the cartilage atrophies particularly on the margin of the head and around the foveola

(8) Rev chir orthop. 41 39-111 1955.

(nonfunctional portions) There is no appreciable involution on the weight bearing area Proliferative and regenerative changes on the periphery of the cartilaginous cap are responsible for varying macroscopic changes In the most atrophied parts of cartilaginous tissue, calcium is deposited Frequently in the weight bearing sector a yellowish brownish coloration of the deeper layers takes place as a result of a concentration of sulfochondroidic acid and deposits of fat calcium and albuminous particles around the cells (perichondrocytic halo)

The bone marrow of the aged is poorly vascularized and almost completely replaced by fat

As a result of long standing and continuous creeping substitution of bone the porotic epiphysis of the articulation undergoes slight modification in shape as an outcome of normal use The manifestations of this modeling of senescence are mainly a tortuous arrangement of the weight bearing trabeculae and a slight but regular flattening of the normal weight bearing area. These changes lead to modifications of the border zone of the head a marginal bulging or a folding of the subcapital segment.

The aging process of a joint cannot be assessed by involution of its structures only or by degenerative changes It has to be considered as an expression of a functional adaptation of tissues with diminished vitality

Osteoarthritis of the hip may supervene at any age. In elderly persons the lesions of arthritis are added to the senile changes of the femoral head as soon as a functional disequilibrium takes place This disturbance at the same time hinders the normal aging process of the joint The typical signs of senescence can by no means be considered as an etiologic factor nor as the first step to the osteoarthritic process

Intermittent Hydrarthrosis is reported by W Bernard Yegge[9] (Univ of Colorado) in 14 women and 1 man Criteria used for diagnosis were uni or bilateral joint swelling recurring periodically and lasting from a few weeks to many years no redness muscle spasm or marked tenderness usually normal leukocyte count no elevation of the sedimentation rate sterile joint fluid and normal x ray appearance of

(9) Rocky Mountain M. J 52:438-441 May 1955

the affected joint The knees were affected in 12 patients, the hands in 1, the ankles in 1 and both ankles and hands in 1 All patients even those with an allergic history had some disturbance of the menstrual periods loss of libido or other endocrine disturbance

In most cases considerable estrogenic regression was seen with the Shorr stain The women were treated with large doses of estrogens and the hydrarthrosis disappeared, at which time the Shorr stain became normal In several patients the condition recurred after discontinuing estrogen therapy but disappeared when it was resumed The patients with a history of allergy were also given allergic treatment In one additional case in which intermittent hydrarthrosis occurred in a joint already affected with rheumatoid arthritis endocrine therapy was without effect

Orthopedic Aspects of Diabetic Neuropathy were studied by Robert H Cram[1] (Univ of Pennsylvania Hosp) in 27 inpatients aged 13-69 (average, 48) The severity of the diabetes did not seem to be an essential factor

Diabetic retinopathy shows a close correlation with diabetic neuropathy In this series 17 patients (62%) had diabetic retinopathy or were blind as a result of cataracts.

The symptoms are variable Dull burning or shocklike pain worse at night occurs in knees ankles hips thighs legs shoulders or wrists Hyperesthesia of the thighs or shoulders and numbness and tingling of the hands and feet are common There may be hoarseness due to laryngeal paralysis In all but one of the 27 patients any or all of the following reflexes were absent the biceps triceps knee and ankle jerks

A characteristic sensory finding is a zone of hyperesthesia of no predictable dermatome distribution Occasionally the hyperesthesia surrounds a zone of hypoesthesia Loss of the sensation of vibration position pain temperature and touch is sporadically noted This accounts for the development of diabetic arthropathy One is struck by the variability of sensory findings from one examination to the next

Muscle power varies from normal to complete paralysis. One patient had paraplegia The dorsiflexors of the ankle

(1) J Bone & Joint Surg 37 A 967 971 October 1955

were involved in five patients Weakness of the muscles of the hands arms knees and ankles was noted in this group in isolated instances

Of the 20 patients whose cerebrospinal fluid was examined for proteins only 4 had a protein content below 45 mg / 100 ml

Control of the diet and insulin therapy are followed by striking improvement in patients with recent symptoms and by arrest of the disease at least in long standing cases

Gout—Now Amenable to Control Elmer C Bartels[2] (Lahey Clinic) reports on benemid* maintenance therapy of gout Most patients had had long standing gout many with tophaceous deposits and all had failed to respond to other therapy *The serum uric acid level usually fell within three* to six weeks after benemid* therapy was begun and in 88 of 95 patients reached normal levels Average level before treatment was 7.8 mg /100 cc and during treatment 4.8 mg a fall of 38% The dose required to sustain a normal serum uric acid level varied from 250 to 3 000 mg daily the average being 1 166 mg Size of the dose and duration of therapy were the two main factors in establishing normal levels Benemid* was started in divided doses of 1 000-2 000 mg daily then adjusted by trial and error depending on the serum uric acid level determined at one or two month intervals

Of 42 patients given benemid* for 12 30 months 39 had satisfactory results After treatment was started 15 had no further attacks 24 had only minor attacks with an occasional severe attack of acute gout all during the first six to nine months of treatment Colchicine did not consistently prevent attacks Three patients had unsatisfactory response to benemid * Serum uric acid levels were normal in two but attacks were as severe as before treatment In one patient serum uric acid level remained elevated despite a daily dose of 2 Gm Injections of ACTH gel every one to four weeks supplementing benemid* maintenance therapy abolished the attacks in two of these patients Undesirable side effects were noted in 6 of 125 patients given benemid * a rash in 2 severe nausea in 3 and troublesome headaches in 1

Benemid* has an important place in therapy of gout pre

(2) Ann. Int. Med. 42:1 10 January 1955

venting attacks and relieving joint pains in patients with tophaceous gout High fluid intake and alkalinization of urine are advisable during the early phase of therapy

Gouty Arthritis Diagnosis and Treatment. Charles J Smyth and E R Huffman[3] (Univ of Colorado) divide the course of gout into stage I asymptomatic hyperuricemia or larval gout stage II acute intermittent gouty arthritis, and stage III chronic gouty arthritis or tophaceous gout.

Larval gout precedes for some time attacks of acute arthritis and is often found in the relatives of persons with known gout This hereditary hyperuricemia develops in males after puberty and in females after the menopause. Persons predisposed by hereditary hyperuricemia may or may not get clinical gout Other pathologic states which may produce hyperuricemia must be excluded

Uricosuric agents are not recommended in this prearthritic stage. However obesity excessive trauma to joints excessive high purine foods and other provocatives of acute gouty arthritis should be avoided.

In stage II the affected joint swells markedly within a few hours and becomes hot, dusky red and extremely tender Though the great toe is most commonly involved any large peripheral joint may be affected A single joint is the rule. Temperature of 101F or higher with leukocytosis may be present Occurrence of subsequent bouts with complete remissions between attacks is characteristic. In 98% of patients the uric acid in the serum exceeds 6 mg./100 cc. Colchicine is a reliable diagnostic aid since acute gout is the only joint disease which responds dramatically to it.

Colchicine is almost uniformly effective and is available in 1/120 and 1/100 gr tablets One should be taken every hour or two hours until pain is relieved or until diarrhea nausea or vomiting occurs From 8 to 16 tablets are required in the average attack. Phenylbutazone 100-200 mg every four hours is as effective as colchicine and without its undesirable gastrointestinal symptoms ACTH cortisone and hydrocortisone are capable both of provoking and of controlling attacks of acute gouty arthritis Between attacks of stage II probenecid is used to reduce the amount of total body

(3) M Clin. North America 39 543-561 March, 1955.

uric acid It is a satisfactory agent for protracted daily administration

In stage III, chronic gouty arthritis, the mild and usually constant arthritic symptoms with superimposed acute attacks have all the characteristics of the preceding stage except that joint manifestations do not entirely subside, response to colchicine is less dramatic deposits of urate crystals occur urate stone may develop in the kidney and albuminuria with or without hypertension and premature arteriosclerosis may appear

In the management of the acute attacks in stage III the same drugs are used in the same manner as in stage II The response is similar except when the episodes extend over several weeks and are unusually severe in this case several courses of colchicine or continuous phenylbutazone therapy will be required Probenecid is recommended in all instances

Polycyclic Continuous Acute Gouty Arthritis Long Term Clinical and Metabolic Study in a patient is reported by William Quitman Wolfson[4] (Wayne Univ) The course was steadily downhill with progressively longer and more severe attacks muscle atrophy and decreasing renal function The difficulties arose at least in part from a conjunction of three factors (1) An unusually severe degree of gouty metabolic disturbance was suggested by unusually severe hyperuricemia and decreased renal urate clearance unusually early appearance of tophi and unusually low urinary 17 ketosteroid coexisting with normal gonadal function sperm counts motility and fertility (2) Effective use of colchicine was impossible due to hypersensitivity (3) A previous report showed that severe gout attacks are often terminated by increased spontaneous activity of the pituitary adrenal system existence of hypopituitarism with respect to ACTH an isolated pituitary defect deprived the patient of this type of endocrine adaptive mechanism

The following therapies were tried colchicine orally or intravenously adjusted to maximal tolerance continuous full colchicinization with continuous administration of ACTH at fully suppressive dosage levels the colchicine-ACTH program supplemented by either probenecid or by

(4) J Michigan M. Soc. 54:323-329 March, 1955.

phenylbutazone, and colchicine ACTH supplemented by both probenecid and phenylbutazone The first two agents gave excellent control of articular manifestations, probenecid (2 Gm /day) normalized urate metabolism and phenylbutazone (400 mg /day) permitted a 60% reduction in ACTH dosage to levels clearly within the safe range These trials revealed the following facts (1) The slight extra daily amount of colchicine which could be given by intravenous colchicinization terminated the polycyclic episode. (2) Hypersensitivity to colchicine was cured during the first brief course of ACTH (3) Severely disabling annual fall hay fever also responded well to ACTH (4) Two Gm probenecid daily returned the serum concentration and renal clearance of urate to about normal (5) Progressive renal impairment and muscle loss were halted and previous losses were partly recovered. (6) While existing tophi did not disappear no new ones formed and if probenecid was used, old ones were no longer irritable or painful

Hepatic Necrosis and Other Visceral Lesions Associated with Phenylbutazone Therapy Toxic manifestations during phenylbutazone therapy for rheumatic disease have been recorded by many observers and in some series of cases the incidence is over 40% Fatalities have also been observed Joan M MacCarthy and R T Jackson[5] (Trinity College, Dublin) report a fatal case of rheumatoid arthritis in a woman 73 who received phenylbutazone and cortisone Daily dosage of phenylbutazone was 600 mg for 18 days The histologic changes at autopsy fell into three categories necrotic parenchymatous lesions in the liver and kidneys granulomas in the epicardium pericardium and lungs and interstitial myocardial lesions

The hepatic and renal lesions were similar to those found in chemical poisoning and were almost certainly due to phenylbutazone The renal tubular damage was of the isolated nephrotic type The histologic changes in the epicardial and pleural lesions were those of the rheumatoid nodule that have been previously described in these sites However in this case the necrosis was not fibrinoid but caseous The interstitial myocarditis was nonspecific and probably anaphylactoid

(5) Brit M J 2 40 242 July 23 1955

It is suggested that in this patient the myocarditis and the necrosis in the liver and possibly also in the kidney were related in so far as with the development of myocarditis, passive congestion supervened and the anoxia thus induced in the parenchymatous cells of the liver and kidney aided the development of necrosis by the toxic action of phenyl butazone

Toxic Effects of Phenylbutazone (Butazolidin®) Review of Literature and Report of 23d Death Following Its Use is made by Edgar F Mauer[4] (Univ of Southern California)

Woman 48 had taken 35 tablets (100 mg each) of phenylbutazone over a period of 22 days because of a painful knee when a rash appeared. Despite prompt withdrawal of phenylbutazone nausea with vomiting burning in the mouth with difficulty in swallowing and generalized aching appeared during the next five days

On hospitalization she had a diffuse, blotchy red rash, which spared only the face and epigastric tenderness which increased to rigidity Laparotomy revealed an acute duodenal ulcer The rash became morbilliform, purpuric and erythematous. On the ninth hospital day the white blood cell count was 28,200 the next day jaundice and intractable diarrhea developed. Two days later the skin began to exfoliate over the entire face neck thorax and all extremities. Temperature suddenly rose over 108 F the patient became comatose and died, 28 days after the first sign of phenylbutazone toxity

Death was due to an acute necrotizing process characterized by infiltration of plasma cells and histiocytes, with little or no infiltration of neutrophils or eosinophils in the various organs studied. This process involved the skin the liver (leading to diffuse toxic hepatitis) and the colon, causing mucosal necrosis and superficial ulceration. Similar lesions were present in the vagina, urinary bladder and else where in the intestinal tract. The bone marrow disclosed marked reduction of the granulocytic series, with absolute neutropenia and a relative increase in monocytes and plasmacytes The erythrocytic series did not appear altered.

The literature concerning the toxicity of phenylbutazone is extensive. Serious reactions have been encountered in the skin gastrointestinal tract, liver kidney and bone marrow as well as in other organs which do not appear to be related to dosage or duration of treatment They may occur after the drug has been withdrawn There are no known methods of predicting an impending reaction and no specific means of treating reactions that have appeared

(4) New England J Med. 253:404-410 Sept. 8, 1955

Major Undesirable Side Effects Resulting from Prednisolone and Prednisone Two new synthetic steroids prednisolone and prednisone, formerly called metacortandralone and metacortandracin respectively have recently been introduced as antirheumatic agents in rheumatoid arthritis They were found to be four times more potent than cortisone in suppressing the inflammatory joint changes of the disease. They also cause depletion of the circulating eosinophils and a significant reduction of urinary 17 ketosteroid excretion. In contrast to cortisone the steroids do not cause sodium and water retention or potassium loss Early experience revealed the occurrence of minor undesirable side effects such as facial rounding hirsutism diminished carbohydrate tolerance insomnia, restlessness weakness transitory mental clouding acne increased skin pigmentation and vague abdominal distress

Alfred Jay Bollet, Roger Black and Joseph J Bunim[7] (Nat'l Inst of Health) report the occurrence of a duodenal ulcer in 3 of 18 successive patients with rheumatoid arthritis treated with prednisolone or prednisone. In addition one of these patients developed a depressive psychosis The duodenal ulcers were asymptomatic and were discovered by periodic gastrointestinal x ray examinations Radiographic studies of the stomach and duodenum done immediately before steroid administration to two of the three patients had revealed no abnormal findings Pretreatment x rays of the third patient were not made None of the patients had a history of ulcer symptoms There was no apparent relation between the duration of treatment or total dose of drug and the appearance of the ulcer

It is suggested that prophylactic administration of an aluminum hydroxide gel concomitant with the use of these steroids might reduce the incidence of peptic ulcer

(7) J.A.M.A. 158 459-463 June 11 1955

Vascular and Neural Complications in Supracondyl Fractures of Humerus in Children. Paul R. Lipscomb ar R. Joe Burleson[8] (Mayo Clinic and Found) studied 108 su pracondylar fractures of the acute extension type seen patients aged 14 or younger during 10 years 73 fractur occurred on the left Neural and vascular injuries were see in 24 instances (22%)

The brachial artery was injured on 11 In 10 patients r radial pulse was felt on admission In two the color and ter perature of the extremity revealed adequate collateral circ lation, but in eight the extremity was cold and cyanotic d to embarrassment of the collateral circulation Becau manipulation of the fracture did not improve the vascul status these eight were treated by open surgery which aim at exploration of the antecubital fossa Two of the eight p tients had actual rupture of the brachial artery In one p tient the artery was impaled within the medullary canal the proximal fragment of bone by a spicule of loose bon The injuries in all eight patients were treated by resecti of the damaged segment of artery followed by block of t stellate ganglion by procaine to facilitate return of collate circulation.

Nerves were injured in 17 of the 108 patients (16%) In t entire group of neural injuries trauma to the radial ner was most prevalent. Surgical exploration for the neural sion itself was necessary in only four patients and then or after observation for three to four weeks During this peri neural function did not improve, although the fracture i tially had been reduced successfully and in most instan was practically healed. In no patient was a nerve found to divided rather the nerves were compressed by old hem rhage, bound down by fibrous tissue or stretched over a fr ment of bone. Recovery was complete in every patient exc one with palsy of three nerves

Usually in nerve injuries neurologic deficits may be p

(8) J Bone & Joint Surg 37 A 487-492, June, 1955

odically observed after reduction of the fracture, but repeated evaluations of function must be performed. If palsies are still present after three or four weeks with no apparent improvement, exploration of the nerve is advised.

[This is an excellent and timely article and should be read carefully by every surgeon who treats or expects to treat fractures.—Ed.]

Fractures of Humerus: Comparative Study in Methods of Treatment. Marcus J. Stewart and John M. Hundley[9] (Univ. of Tennessee) reviewed more than 1,000 cases of fracture of the humerus covering the era of the so-called rigid plaster fixation through the present stage of the hanging cast, a period of 15 years. A total of 546 patients were adequately followed: 271 with fractures of the neck, 223 of the shaft and 52 of the head. The fractures of the neck and shaft were studied with respect to the type of treatment and results.

It was found that undisplaced fractures of the neck of the humerus or impacted fractures in patients over 60 are best treated by a collar-and-cuff sling and early active exercise. Impacted adduction fractures of the neck must be reduced and immobilized in abduction. As a rule, abduction fractures without avulsion of the greater tubercle may be reduced by manipulation and immobilized in a hanging cast. If the tubercle and rotator cuff are displaced, they must be reduced accurately, usually by surgery.

The treatment of choice for all fractures of the shaft at any level is the hanging cast, provided (1) traction is never excessive, (2) angulation and apposition are controlled and (3) the "hanging-cast rules" are observed. Although fractures of the shaft may be treated successfully by the abduction splint, return of function will be delayed, the apparatus will require continual attention and the patient will be less comfortable than with the hanging cast. The shoulder spica is rarely indicated in the treatment of any fracture of the humerus.

Anesthesia is seldom necessary for reduction of uncomplicated fractures of the neck or shaft, provided that traction is properly utilized. Thus the necessity for hospitalization is reduced to a minimum.

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(9) J. Bone & Joint Surg. 37-A:681-692, July, 1955.

Results of Treatment in Fractures of Neck of Radius in Children with Special Reference to Premature Fusion of Epiphysial Line. In children, injuries to the upper part of the radius are located chiefly in the neck When the epiphysial line is still open fractures of the head are extremely rare although such cases have been reported. Pure epiphysiolyses of the radial head are also rare in these as in other types of epiphysiolysis a fragment of varying size often splits off from the metaphysis Another group consists of transverse and oblique fractures occurring distally to the epiphysial line

Sven Kehnberg[1] (Univ of Helsinki) made follow up examinations in 37 children with fracture of the neck of the radius (27 epiphysiolyses and 10 situated more distally in the neck) In simple and reduced cases both the functional and anatomical results were good In more severe unreduced cases there was frequent although slight limitation of movement Premature fusion of the epiphysial line was demonstrated in about 50% of the epiphysiolyses and often led to a slight valgus deformity

Accurate reduction should be attempted in all of the more severe cases Although the result in unreduced cases may be both functionally and anatomically quite satisfactory accurate reduction still guarantees substantially better results

Some Observations on Fractures of Head of Radius with Review of 100 Cases. Mark L. Mason[2] investigated the end results in 100 random patients treated by conservative and operative measures No patient was included who had also sustained dislocation of the elbow or fracture of the other components of the joint, apart from minor chip fractures

Because the head of the radius consists of dense cancellous bone, running in a more or less longitudinal pattern the fractures tend to run obliquely or longitudinally During flexion and extension of the elbow the radial head glides forth and back over the capitellum of the humerus The capitellum and the head are reciprocally curved but they contact only when the elbow is flexed to 130 degrees and the radius is in the mid prone position Thus for the flexion or extension range of movement to be limited a moderately severe mechanical in

(1) Acta chir scandinav 109:210-214 1955.
(2) Brit. J Surg 42 123-132, September 1954

terference with this gliding motion must be present. Full rotation at the proximal radioulnar joint requires accurate anatomical position of the head of the radius in the radial notch of the ulna.

The fractures were classified into three clinical types corresponding to the radiological findings type I fissure fractures or marginal sector fractures without displacement type 2 marginal sector fractures with displacement and type 3 comminuted fractures involving the whole head of the radius

Each of 62 patients with a type I fracture conservatively treated regained full function of the elbow joint and returned to normal work in an average of 4.8 weeks Six patients complained of minimal discomfort on the medial joint aspect 42 showed a full range of motion and 20 an average loss of 8 degrees of extension movement of the elbow joint

Of 20 patients with type 2 fracture, 7 in whom the sector fracture was less than one-fourth the circumference of the head depressed below the joint line but not tilted in any way and which were treated conservatively and 5 patients treated by excision of the head because of gross interference with the radiohumeral joint all returned to their normal duties in an average of 5 and 8 5 weeks respectively All lost full extension of the elbow joint but rotation range was full in the five patients with resections and limited by only 30 degrees in the conservatively treated patients Eight fractures of this type were labeled borderline—had maximal displacement of the marginal segment fracture for consideration of conservative management In these patients there was an average loss of 15 degrees of extension and 60 degrees of loss of rotation They returned to work in an average of 11 5 weeks but four patients were unable because of this rotation loss to return to normal work

Of 18 patients with comminuted fracture (type 3) of the radial head treated by early excision 17 regained full use of the elbow joint and returned to normal work in 9 5 weeks. Only one patient who also had myositis ossificans, had poor function of the elbow joint.

The case on the borderline between conservative and operative treatment should not be regarded as an entity The

axiom in the treatment of fractures of the head of the radius should be If in doubt—resect

Fractures of Head of Radius Carruth J Wagner[3] (U.S P H.S Hosp Staten Island, N Y) followed 66 cases of fracture of the radial head for five or more years All injuries were treated according to the following method

TECHNIC.—The elbow was aspirated and a few cubic milliliters of 0.5% metycaine® was instilled into the joint. After relief of pain an attempt was made to carry the joint through a full range of flexion, extension pronation and supination Any bony block to full motion or persistent click in a particular movement was positive indication for resection of the radial head. A full range of motion without clicking or grating was positive indication for conservative therapy unless loose bone fragments were present. All comminuted fractures with separation of one or more loose fragments were resected.

Conservative therapy consisted of total immobilization for the first 10 days and partial immobilization for 14 days. After four weeks progressive resistance exercises were initiated in all four directions

Operative treatment consisted of a direct approach to the radial head between the extensor carpi radialis brevis and extensor digitorum communis. The head was excised just distal to the distal cartilaginous border of the radial notch on the ulna. The cut end of the radius was treated with bone wax and left uncovered. The fibrillated cartilage at the site of impact on the capitulum was removed and the wound closed in layers.

On resecting the head of the radius enough must be removed to allow the neck to clear the radial notch on the ulna or a bony block will result in limited pronation and supination. If the cut end of the neck is covered, it is important not to involve the annular ligament in the suture or to pull the synovial cuff from between the neck and this ligament.

Results at one year were substantially the same as those at five years in the resected group whereas some improvement occurred in cases of conservative treatment. This improvement is not considered statistically significant Wagner believes that one year is enough time to evaluate the results of treatment of fractures of the head of the radius

An anatomic classification of fractures for purposes of deciding the treatment is unreliable. The amount of damage to the radial head seen at operation usually far exceeds that demonstrable in a radiograph.

(3) Am. J Surg 89 911-918 April, 1955

New Principle in Operative Treatment of Trochanteric Fractures of Femur designed to avoid the complications of the nail plate is described by W Schumpelick and P M Jantzen[4] (Hamburg Germany) Complications usually result from rigid union of the nail and plate. If the nail is driven in as far as the thin cortex of the femoral head it will protrude into the joint as absorption occurs at the fracture site and muscle pull or weight bearing brings the fragments together If the nail is not driven to within 10-15 mm of the articular margin its tip will be insecurely fixed the nail will cut upward and the result will be coxa vara

The gliding screw plate (Fig 96) allows the screw to glide out in the same way that a Smith Petersen nail glides out as fracture fragments telescope in the course of absorption following fractures of the femoral neck. The screw plate of stainless antimagnetic steel (V2A) consists of (1) the screw the broad threads of which must be so few that they always end proximal to the fracture line and (2) the plate which is U shaped for bending strength At the upper end of the plate there is a cuff fixed at 135 degrees in which the screw glides. The junction between cuff and plate is so strong that breaking or further bending cannot occur The screw cannot jam in the cuff For routine operations a single angle is sufficient. *In special cases (e.g fixation of a subtrochanteric osteotomy* for pseudarthrosis of the femoral neck) a plate with the cuff fixed at a more acute angle is desirable. The holes through which the screws holding the plate to the femoral shaft are inserted are oblong For pertrochanteric fractures two screws suffice for subtrochanteric fractures the plate must be longer and three screws are needed The screws are inserted at the lower end of the opening and are joined to each other by a small flat plate gliding in the U shaped plate, so that the latter may glide downward when the fracture fragments telescope (*Fig 97) Pressure on the femoral* head in the direction of the body axis will be diverted by the gliding screw into the direction of the screw axis so that it strikes the fracture line approximately at a right angle and acts as a favorable compressing force

Four deaths occurred among 28 patients (average age

(4) J Bone & Joint Surg 37 A 691-698, July 1955.

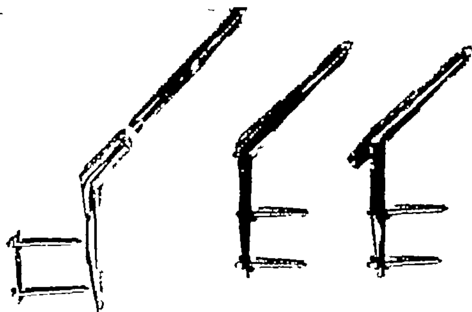




Fig 96 (above) —Gliding screw plate: left, disassembled; center correct position after operation right, after screw has glided out of cuff.

Fig 97 (left) —Two weeks after operation: full weight bearing has been started, fracture fragments have begun to telescope and screw has glided out of cuff.

(Courtesy of Schumpelick, W., and Jantzen, P. M. J Bone & Joint Surg 37 A 693-698, July 1955.)

77.7). Average hospitalization for 18 pertrochanteric fractures was 48.5 days and for subtrochanteric fractures 58 days. Three infections, one extensive, occurred despite routine use of antibiotics. Union of the fracture occurred in all cases. Follow-up of 12 patients, 7-22 months after operation, showed that 5 had good and 7 fair range of movement.

Prognosis and Treatment of Fractures of Tibial Condyle. W. van der Slikke[5] (Rotterdam) compared outcome of fractures of the tibial condyle in two groups of patients. In one group, the condylar fractures were generally treated by *active and passive exercises, some by casts and a few by surgical* reposition and fixation. In the other group, the fractures were treated by a cast, surgically or both. Follow-up studies were made of 49 patients. Age did not affect the prognosis. Results were more favorable in unicondylar than in bicondylar fractures.

Adhesions and rigidity of the ligaments of the knee resulted mainly from immobilization, whether by a primary plaster bandage with or without reposition of fragments or by immobilization after surgical treatment. Adhesions and rigidity of ligaments are best controlled by early active and passive exercises.

X-rays of anatomic reposition do not indicate ultimate function, as the new plateau formed by cartilage is seen only at operation or autopsy. Thus, conclusions regarding function should not be based on x-ray features, for the function of a joint is not determined—at least not completely—by its form; on the contrary, function influences form. Since anatomic reposition is of no importance, surgical treatment is undesirable, as it involves serious risk of rigidity of the knee joint.

Treatment of choice consists of an extension bandage and active and passive exercises of the knee joint, which should be started as early as possible and should continue until weight bearing can be permitted.

[There is a wide difference of opinion among fracture specialists in the United States, just as there is in other countries, with regard to whether fractures of the tibial condyle are best treated by the open or the closed method. Although many orthopedic surgeons and other surgeons with

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(5) Arch. chir. neerl. 7:19-36, 1955.

wide experience in treatment of these fractures would agree with the author that surgical reduction and fixation should be avoided whenever possible, others with equally wide experience and equally good judgment would radically disagree. The editor has had the opportunity of observing a number of reported series of patients in which one or the other of the methods has been used. It has been our experience that the best end results of any methods we have observed or used have been obtained with early operation, including the most accurate possible reduction of fragments and care of the complications of internal derangements in the knee, such as removal of torn and displaced menisci or elevation of depressed articular surfaces of the tibial condyle, followed by active and passive exercises within a few days. It is the editor's opinion that the poor results referred to by the author and reported by others when open surgery has been used have been the result of much too prolonged, rigid immobilization after the surgery. There is not as much need for rigid immobilization after open surgery with accurate internal fixation of the fracture fragments as would be required when no surgery is carried out.—Ed.]

Treatment of Fractures of Tibial Condyle and Results. Josef Ender[6] (Vienna) reports on 303 fresh fractures of one or both tibial condyles and infracondylar fractures with fracture lines within the knee treated during 1925-48

Of 205 monocondylar fractures 184 were of the lateral and 21 of the medial condyle In this group there were 88 cases in which only fissures depressions of the articular surface under 5 mm or small fragments were found In 34 there was caudal or less frequently cranial angulation of the entire or a large portion of the condylar fragments Most of these fractures were treated conservatively seldom was a Steinmann nail necessary Bed rest was of 2 3 weeks duration and immobilization was continued for 8-12 weeks In 21 monocondylar fractures there was lateral displacement of the condyle (Figs 98 and 99) In such fractures the tibial condyle becomes larger than normal and there is a rent of the medial ligament Conservative treatment is best. Enlargement of the articular surface is unimportant in the function of the knee There were 25 cases of compression of the articular surface with a rent of the contralateral ligament. Treatment was successful In 37 cases the whole lateral articular surface was impacted. In these cases operative elevation of the articular surface was done. Bed rest was continued for 6 weeks and immobilization for 8-10 weeks

In most of the 100 bilateral condylar fractures the frag-

(6) Arch. orthop. u. Unfall-Chir 47:287 306 1955

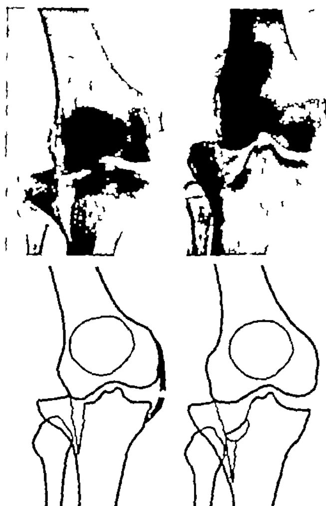


Fig 98 (left) —Fracture of lateral tibial condyle with lateral displacement and rent of medial longitudinal ligament.

Fig 99 (right) —Fracture of lateral tibial condyle with lateral displacement of large part of articular surface laterally and impaction of small part of articular surface in fracture cleavage

(Courtesy of Ender J Arch orthop. u. Unfall-Chir 47 287 306, 1955)

ments were displaced Most of the fractures were conservatively treated In 49 cases of infracondylar fracture there was no involvement of the articular surface which indicates a good prognosis only splintered fractures of this type have a bad prognosis

In 67 fractures of one condyle without displacement bed rest averaged 1 18 weeks in 104 monocondylar fractures with displacement 2.24 weeks and in 62 bi or infracondylar

fractures 3.44 weeks Length of time of immobilization by cast in each of the foregoing categories was 5.65, 8.04 and 8.92 weeks respectively

In 177 cases there was no resultant flexion in 52 healing was in about 5 degrees of flexion and in 26 flexion was 10-20 degrees Extension of the knee was possible without stop in 75.4% of cases and was inhibited over 10 degrees in 3.57% Flexion of the knee more than 90 degrees was possible in 72.9% Normal gait is present in 166 cases In 35 arthrodesis developed in an eight year follow up Later incidence will probably be higher because arthrodesis is a late complication of this fracture This complication occurs most frequently in deep unilateral impacted or in bilateral fractures

In about 80% of unicondylar fractures conservative treatment is possible The indication for operation is the necessity of elevating an impacted articular surface or failure of conservative treatment

Fractured Rib—A Significant Injury Analysis of 730 Consecutive Cases is presented by Richard L. Rapport Robert B Allen and George J Curry[7] (Hurley Hosp Flint, Mich) The fractured rib frequently is an extensive injury responsible for many complications and is associated with a relatively high mortality rate. This is substantiated by a review of the literature

Of the 730 patients with rib fractures 490 (67%) were inpatients of these 202 had 444 associated complications Subcutaneous emphysema was the commonest complication to the chest wall occurring in 67 patients It was seldom serious Paradoxical respirations due to rib fractures with a flail or stove in chest occurred in 21 patients and in 7 of 34 patients who died Blood was found in the pleural space of 62 patients If hemorrhage is progressive despite thoracentesis early thoracotomy with evacuation of clots and control of hemorrhage is indicated.

Pneumothorax was demonstrated by x rays in 59 patients For traumatic pneumothoraxes if the collapse is greater than 25% closed catheter drainage is suggested Pleural effusion was seen in only nine patients and chylothorax in none. The former seldom occurs in the presence of hemothorax or pneu-

(7) A.M.A. Arch. Surg. 71 7 13 July 1955

mothorax if early and vigorous efforts are made to re-expand the lung Management should consist of persistent thoracentesis

Pulmonary complications occurred in 32 6% of the 202 inpatients In treating this complication the first consideration is an unobstructed airway and evacuation of the tracheobronchial tree. Intercostal nerve block should be done early When pain is relieved the patient coughs and clears his own secretions dramatically If cough is impossible or ineffective, nasotracheal catheter aspiration or bronchoscopy may be necessary

Mediastinal complications, cardiac injuries and traumatic asphyxia were rarely encountered

Complications at or immediately below the diaphragm developed in 58 patients Trauma to abdominal organs was found in 28 The kidney and liver were most frequently involved closely followed by the spleen A lacerated diaphragm was found in seven patients.

Of the 490 inpatients 4 9% died with the thoracic injury as the sole or a decisively contributing factor to death

Use of Radioactive Phosphorus (P^{32}) to Determine Viability of Head of Femur at the time of the acute fracture was studied by H B Boyd D B Zilversmit and R. A Calandruccio[8] (Univ of Tennessee)

It is assumed that avascular necrosis is a result of diminished blood supply to the femoral head due to the trauma per se and to the management of the fracture The relative amount of radioactivity in the head of the femur after injection of P^{32} is believed an index of the viability of the bone. The numerical value of the counting rate in the head varies with dosage and other factors The ratio of the counting rate in the trochanteric area to that in the head eliminates these irrelevant variables

Two microcuries of P^{32} per pound of body weight was injected intravenously in patients with fractures of the femoral neck, approximately 1½ hours before the counts were taken Adequate clinical data were obtained from 53 patients (32 with acute fractures of the femoral neck, 10 with trochanteric fractures 10 with old fractures and 1 with traumatic

(8) J Bone & Joint Surg 37 A:260-269 April, 1955.

dislocation of the hip) Since avascular necrosis does not develop in patients with trochanteric fractures counting rates were recorded in these patients to ascertain the relatively normal trochanter to-head ratio of radioactivity

The ratios of radioactivity of the 32 patients with acute fractures of the femoral neck ranged from 1 3 to 16.7 Experience has shown that in approximately one third of patients with complete fractures of the neck of the femur avascular necrosis develops Therefore in the 10 patients (about one third of this series) with the highest ratios the prognosis would probably be poor These ratios compare favorably with the ratios of 5 6-17.5 obtained in patients with known avascular necrosis

In patients with trochanteric fractures the ratios were 0.7-1.9 therefore in the 12 patients with ratios of 1.3 2.3 the prognosis would probably be good No prediction can be made concerning the 10 patients with ratios of 2.5-3.9

Treatment of Actual and Imminent Pathologic Fractures of Femur by Intramedullary Nailing According to Ephraim L. Bennish and George Hammond[9] (Lahey Clinic, Boston) prophylactic nailing of imminent pathologic fractures prevents pain possible shock and displacement of fragments Also the patient is in relatively better condition and the procedure less shocking and smaller in magnitude than would be true after fracture.

TECHNIC.—*For actual fracture*—Open nailing is used. The fracture is exposed by a lateral incision in the thigh. A guide pin is passed up the proximal fragment in retrograde fashion, emerging through the greater trochanter and a stab wound in the buttock. A Kuentscher nail of predetermined length is driven over the guide pin down to the fracture site, and the pin is removed and reintroduced from above. The fragments are reduced, and the nail is passed across the fracture site well down into the distal fragment over the guide pin, which is then removed.

For imminent fracture—Closed nailing is used. The nail is passed, under fluoroscopic control, down the medullary canal of the femur over a guide pin which has been inserted down the shaft from the greater trochanteric region.

The authors report on three patients with fractures of the femoral shaft due to carcinoma and managed by intramedul

(9) S. Clin. North America 35:863-872, June, 1955.



Fig 100 (left) —Anteroposterior view showing areas of destruction throughout femur and a pathologic fracture at level of maximal destruction

Fig 101 (left center) —Five days after operation showing excellent reduction and nail fixation.

Fig 102 (right) —Seven months after operation. The progressive destruction is obvious. Fracture has united in excellent position, but callus seems involved by the malignancy

(Courtesy of Dennish, E. L. and Hammond, G : S. Clin. North America 35:865-872, June, 1955)

lary Kuentscher nailing This procedure gave pain relief excellent reduction and fixation of fragments early ambulation absence of complications ease of after-care and relatively short hospitalization Two of the patients had bony union of the fracture (Figs 100-102) One patient with an impending fracture due to widespread involvement by fibrosarcoma was treated by closed prophylactic intramedullary nailing

Total Dislocation of Foot at Ankle Joint Luxatio Pedis cum Talo Rolf Simon Weidner[1] (Vienna) describes the anatomy of the ankle and discusses the uncommon total dislocation of the astragalus out of the malleoli Displacement is either anterior or posterior lateral displacement is usually

(1) Arch. orthop. u. Unf II-Chir 47 56-64 1955

combined with fracture of one or both malleoli The pathogenesis of the luxation is not clear It is possible that extreme plantar or dorsal flexion with a combination of traction of the extensor or flexor tendons causes the dislocation In two cases reported, one of anterior and one of posterior displacement after accidents excellent results were obtained after reduction and immobilization in plaster Repositioning of the joint should be done as rapidly as possible to avoid necrosis

Further Experiences with Phemister Plastic Repair Treatment of ununited fractures by onlay bone grafts without screw or tie fixation and without breaking down fibrous union was reported in 1947 by Phemister A.M Fehr and W Rieben (Winterthur) treated 40 fractures of the extremities and the clavicles by this method Three to five months are required for union of the fragments in cases with retarded callus formation and six to seven months in cases of pseudarthrosis Usually two small homografts are deposited under the periosteum of the fragments Additional implantation of spongiosa or a fibular osteotomy made no difference in the healing time.

Union takes place in one of two ways (1) periendosteal callus formation occurs first followed by fusion of the graft with the bone (2) the process may be reversed with fusion the primary event. A fresh graft does not accelerate healing more than a cold preserved one Failure resulted in only two cases of pseudarthrosis defect

A suggested new indication for this method is in treatment of fresh fractures in which difficulties in consolidation are expected, e.g transverse fractures of the tibia or forearm Perhaps the combination of bone marrow nail and onlay graft will prove useful

Implantation of onlay grafts is a technically simple procedure used with success in cases of retarded callus formation and pseudarthrosis

Bryant s Traction Provocative Cause of Circulatory Complications. Jesse T Nicholson Robert M Foster and Robert D Heath[3] (Children s Hosp Philadelphia) report on six children treated with traction for simple fracture of the fe-

(2) Helvet. chir acta 21:411-420 December 1954.
(3) J.A.M.A. 157:415-418, Jan. 29 1955

mur Five had circulatory impairment in the uninjured leg

The first degree of circulatory involvement was ischemic fibrosis of the muscles of the lower leg with a residual equinovarus deformity This could readily be mistaken, because of the foot deformity for peroneal nerve paralysis There was no real sensory loss, but there were patches of sensory impairment The ankle and foot were almost rigid and muscle power was almost entirely lost below the knee except in

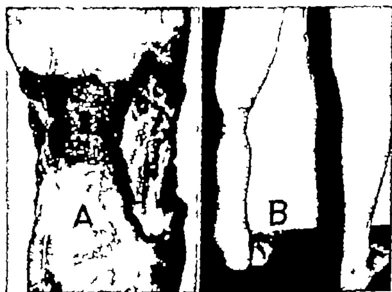


Fig 103 —*A* left leg of boy 6, 11 weeks after fracture of right femur band of circumferential necrosis below knee is characteristic. *B* same leg four months after skin grafting. Scar is constricted, lower leg is edematous, foot is held in equinovarus position. (Courtesy of Nicholson, J T., *et al.* J.A.M.A. 157 415-418 Jan. 29 1955.)

the short toe flexors The second degree of involvement included in addition a circumferential band of necrosis of skin and underlying muscles in the calf region (Fig 103 *A*) which healed with a cufflike defect from adherent scar circling the leg (*B*) The third degree of involvement also included gangrene of the foot.

Several factors have been observed to have adverse influence on circulation of a leg placed in Bryant s traction Reduction in hydrostatic pressure of the vertical leg has been suggested as a factor that combined with secondary factors, causes circulatory impairment Figure 104 shows the pressure required to raise a column of water to a height equal to

the height of the toes above the heart, when the leg is suspended The heights are average measurements for the ages indicated In groups of children aged 2-6, the drop in blood pressure was measured by average differences in oscillometric readings at the ankle with the leg horizontal and with the leg vertical The theoretical loss in hydrostatic pressure was obtained by measuring the average height of the ankle above the heart in the vertical leg of the same children. Drop in blood pressure and height of leg were found to correspond. This substantiated the fact that the reduction in ankle blood pressure is in almost direct proportion to the hydrostatic

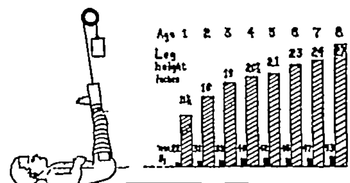


Fig. 104 —Shaded columns show average distances of feet above heart in children, 1-8, in Bryant traction position. Black columns represent the hydrostatic pressure, in millimeters of Hg required to support a column of water the height of the shaded columns. (Courtesy of Nicholson, J T., *et al* J.A.M.A. 157 415-418, Jan. 29 1955.)

pressure necessary to maintain a column of water at a height corresponding to the height of the ankle above the heart. By making repeated oscillometric readings over 12 hours on a leg in Bryant s traction it was found that the lowered blood pressure at the ankle remains constant and does not compensate.

When bandages were loosely applied bandaging did not cause further lowering of the blood pressure reading but when bandages were snugly applied particularly in children more than 2 years old pressure could be reduced to zero

The influence of hyperextension of the knee on circulation in the lower leg was investigated. Oscillometric readings were recorded while the knee was hyperextended without a bandage, first with the leg horizontal then vertical (Fig 105)

Fat Embolism in Connection with Treatment of Fractures. L. A Saikku[4] (Univ of Helsinki) reviewed 881 fracture cases in 524 of which conservative treatment (plaster cast or traction) was used and in 357 operative treatment, with marrow nailing in 86 of the latter There were 25 deaths 8 of them due to fat embolism Diagnosis was based on clinical symptoms and on pathologic investigations in which special fat staining was used Two patients with fat embolism recovered Except in one case all fat embolisms occurred during conservative treatment In one case of fat embolism the femoral vein was tied and this measure appeared to have a favorable effect on the patient s condition

Traction in fractures of the long bones of the lower limbs seems to be the most dangerous measure from the point of view of fat embolism If complete immobilization is achieved operative treatment does not increase the danger of this condition

Fat embolism can be diagnosed on the basis of clinical examination the most important symptoms being general diffuse cerebral manifestations (delirium coma convulsions) pulmonary symptoms (cough cyanosis dyspnea) petechiae (on the eyelids on the neck and in the supraclavicular fossa) changes in the retina and presence of fat in urine and sputum

Decrease in blood pressure and increasing hemoconcentration as in shock was not observed Neither were there any symptoms of increased intracranial pressure typical of brain injuries

Osteoporosis and Compression Fractures from Prolonged Cortisone and Corticotropin Therapy are reported by William Sawyer Eisenstadt and Ephraim B Cohen[5] (Mount Sinai Hosp Minneapolis)

Man, 57 with intractable bronchial asthma for 10 years, was given 50-100 mg cortisone daily by mouth. Three months later 20-40 mg ACTH daily was substituted. In the next 3 years he had alternate remissions and exacerbations requiring 13 hospitalizations during which ACTH dosage was 80-120 mg daily Eleven months after corticoid therapy was begun, he had abdominal distress and a duodenal ulcer was visualized. After 33 months of therapy he had severe low

(4) Acta chir scandinav 108:275-282, 1954
(5) Ann. Allergy 13:252-256, May June, 1955.

back pain. Marked osteoporosis of the lower dorsal and lumbar vertebrae and pelvis and multiple compression fractures of the lumbar vertebrae were demonstrated Blood serum levels were calcium, 9.3 mg./100 cc. phosphorus 3 4 mg total proteins 6 Gm. albumin, 3 6 Gm. globulins, 2.4 Gm. fasting blood sugar 206 mg, CO_2-combining power 39 5 mEq /L. chlorides 87.5 mEq, sodium, 146 mEq potassium 5.2 mEq., and alkaline phosphatase 6 Bodansky units. Glucose tolerance curve showed a decrease. Urinary calcium excretion was 194 mg in 24 hours

After three weeks of combined estrogen and androgen therapy (0 04 mg ethinyl estradiol and 10 mg methyltestosterone daily) definite relief was noted. He continued daily maintenance dose, with a week's rest period every four weeks with no recurrence of back pain. Osteoporosis had not changed.

For earliest detection of osteopathy from steroid therapy, urinary calcium excretion studies should be done serially Any values above 150 mg daily indicate negative calcium balance Serial x rays also detect early osteoporosis

Androgens and estrogens and a high protein diet should be given and activity encouraged Calcium need not be added to the diet. Maintenance therapy should be interrupted every four to six weeks for a week. In women androgens may cause masculinization and in men may be carcinogenic to the prostate gland

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THE SPINE AND PELVIS

Aging Vertebral Column Macro- and Historadiographic Study Fedor Bohatirchuk[6] (Univ of Ottawa) found that aging of the vertebral column of both dog and man follows along approximately similar lines despite the fact that the canine vertebrae do not support the weight of the body A study of 75 men and women 69 of them over age 60 showed that normal aging signs may be observed in persons who do not complain of any pain or even discomfort Bone atrophy and bone hypertrophy develop together in the aging verte

(6) Brit. J Radiol. 28 389-404 August, 1955.

bral column Vertebral atrophy is distinct from senile osteoporosis " which is a disease with typical clinical symptoms Historadiographs of vertebral atrophy in normal aging give new facts in the mechanism of bone decalcification during atrophy Atrophic bone loses its calcium not only via osteoclasts but also probably through halisteresis

Historadiographs also show that the bone structure in case of normal aging in the area of vertebral lippings is quite identical with bone structure in the principal bone Hypertrophic process is thus a continuing bone growth rather than development of an abnormal bone Such abnormalities as cavities and impregnation of these cavities with calcium bone destruction etc. were only found in cases of pathologic hypertrophy These facts show that it is necessary to revise the concept that every lipping is a sign of hypertrophic arthritis since these hypertrophic manifestations in old age may be found in quite normal persons who show no clinical symptoms of arthritis

Comparative Studies of Diskography and Myelography were made by Julius Wolkin Maurice D Sachs and George H Hoke[7] (Western Reserve Univ) In 18 patients diskography and myelography were done in 9 others diskography alone was carried out. These 27 consecutive patients represented clear-cut clinical examples of herniated disks and in most instances neither myelography nor diskography was considered necessary for diagnosis In 11 of the patients who had diskography and myelography both procedures were accurate. Considered alone myelography was completely accurate in nine, partly accurate in three falsely negative in four falsely positive in one and unsatisfactory in one Diskography was completely accurate in 18 of 27 cases partly accurate in 7 falsely positive in 1 and unsatisfactory in 1 There were no false negative diskograms

Although the series was small the evidence indicated that the over all accuracy of diskography is superior to myelography (Figs 106 107 and 108) A normal diskogram offers strong evidence against the diagnosis of a herniated lumbar disk Unsuspected multiple herniations were seen more often during diskography Reduplication of radicular pain during

(7) Radiology 64:704-713 May 1955



Fig. 106 (left) —Myelography demonstrating vertical central defect of the column of pantopaque,® which might have been due to previous surgery or edema.

Fig. 107 (right) —Lateral view showing posterior defect at 4th lumbar space. (Courtesy of Wolkin, J *et al.* Radiology 64:704-713 May 1955)



Fig 108.—Diskograms revealing posterior protrusion and extravasation of medium at 4th lumbar and degeneration and posterior protrusion at 5th lumbar spaces. At operation, frank rupture was found far laterally in the 4th foramen of the left 4th lumbar disk, with normal appearing disk on the left at 5th lumbar (Courtesy of Wolkin, J., *et al.* Radiology 64:704-713 May 1955)

injection may further support the diagnosis of herniated disk

Diskography is not recommended if there is question of a tumor or other pathologic change involving the nervous system It should not be substituted for myelography when the latter is indicated. On the other hand diskography is a direct apparently safe relatively accurate and rapid adjunctive procedure for diagnosis of herniated lumbar intervertebral disks

Clinical Significance of Transitional Lumbosacral Vertebra Relation to Back Pain, Disk Disease and Sciatica is discussed by Frank E. Stinchfield and William A Sinton [8] Typical sciatic pain may be due to a transitional lumbosacral vertebra. In 90% of the authors patients with unilateral sacralization of a vertebra proved at time of surgery the sciatic radiation of pain was on the mobile side. In only 54% could

(8) J.A.M.A. 157 1107 1109 Mar 26, 1955.

the degree of immobility of the transitional vertebra be assured from x rays taken preoperatively Disk herniation between the transitional segment and the sacrum almost never appeared in this series as all but one herniation were at the level above the anomalous vertebra

One of the points of diagnosis of sciatica caused by transitional vertebra is that its onset is simultaneous with insidious back pain Neurologic signs—hypesthesia over the 5th lumbar and 1st sacral dermatomes and decrease in ankle jerk—were present in 15 negative disk explorations This indicates that neurologic changes can be present without demonstrable nerve root pressure

The authors believe that strain low in the back is transmitted to the joint above the transitional vertebra For this reason when surgery is required the fusion should extend from the sacrum to the vertebra above the transitional segment Successful fusion has eliminated back pain as well as signs and symptoms of sciatic radiation of pain

Syndrome of Herniation of Lower Thoracic Intervertebral Disks with Nerve Root and Spinal Cord Compression Presentation of Four Cases with Review of Literature Methods of Diagnosis and Treatment. Joseph A Epstein[9] (Brooklyn) reports on four patients aged 30-55 with disabling symptoms caused by herniated thoracic intervertebral disks Three complained of severe incapacitating pain radicular in nature intermittent and of varying frequency with a tendency to become constant The other patient had painless onset of a spastic ataxic gait as the only complaint

Radicular pain caused by irritation of thoracic nerve roots may mimic closely abdominal pain of visceral origin, intercostal neuralgia pleurodynia and angina. Since the laterally lying disk does not involve the spinal cord early in its course central nervous system disease is rarely suspected in the differential diagnosis Despite the fact that diagnostic studies such as pyelography and gastrointestinal series give negative findings unnecessary abdominal and thoracic exploratory operations are performed. This was done in two of the patients and narrowly avoided in a third

Spinal fluid studies and roentgenograms of the spine may

(9) J Neurosurg 11 525-538, November 1954.

reveal no abnormalities but properly performed myelography is diagnostic.

The excellent results of surgery in these patients indicate that if the diagnosis is established early, when minimal radicular and cord damage exists the prognosis is much more hopeful

Nonoperative Treatment, Including Manipulation, for Lumbar Intervertebral Disk Syndrome was used in 285 patients by Merrill C Mensor[1] (San Francisco) With rest

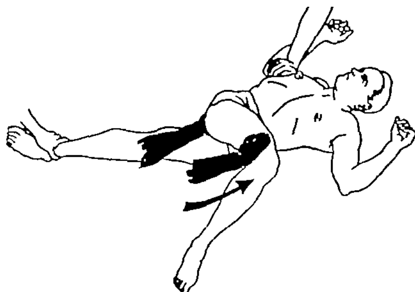


Fig 109 —Back manipulation for herniated disk (right leg) (Courtesy of Mensor M. C. J Bone & Joint Surg. 37 A·925-936, October 1955)

support rehabilitation exercises (with or without physical therapy) and time, gradual remission is expected with manipulation added sciatic pain is relieved immediately in successful cases

Technic.—With the patient in the contour position, skin traction is applied to both lower extremities. Afterward manipulation is carried out under sodium pentothal* anesthesia, with patient supine. The involved extremity is manipulated first, by rotation internally flexion and adduction using the limb as a lever and adding to the force applied by thrusting with the other hand against the ilium in the direction of the leverage (Fig 109) This usually produces audible

(1) J Bone & Joint Surg 37 A:925-936, October 1955

crunching The procedure is then repeated on the opposite side. After manipulation, traction is reapplied for about five days. Weight bearing is allowed first for two or three weeks then flexion exercises are begun The patient returns to work in four to six weeks. Heavy lifting is avoided for several months A brace is usually worn for about three months with gradual removal

Results were satisfactory in 64% of 72 private patients and in 45% of 133 industrial cases Immediate failures in the two groups were 20% and 29%, delayed failures 5% and 8% respectively These differences are explained by the compensation factor and the larger percentage of industrial patients engaged in heavy labor Follow up was 6 months to 10 years (average 22.8 months) Average age was 39.8 184 patients were men In 56 (27%) in whom conservative treatment failed interlaminar operations showed three distinct types of pathologic disks (1) intact or redundant annulus with protrusion of a hard cartilaginous fragment firmly locked in the interspace (2) rupture of annulus with relatively large amount of nucleus free in spinal canal and (3) degenerated nucleus with redundant annulus allowing increased mobility of central mass

Manipulation should be favored over operation except when definite contraindications exist Satisfactory results if obtainable are expected after one or at most two manipulations (17% were manipulated twice) Repeated manipulation is not justified Failure to respond to conservative treatment warrants prompt surgical intervention if incapacity is pronounced Some cases are not amenable to manipulation but premanipulation differentiation is impossible

Osteomyelitis of Spine Due to Salmonella Cholerae Suis is reported by Edgar L. Ralston[2] (Hosp of the Univ of Pennsylvania)

Man 28, a plasterer was hospitalized because of low back pain accompanied by fever for three days. He had considerable pain on any movement of the spine Temperature was 102 F and pulse rate 72. General physical examination revealed nothing unusual The spine was acutely tender along the right iliac crest just lateral to the posterior superior spine There was moderate guarding of the paravertebral muscles both anteroposterior and lateral motions were limited to less

(2) J Bone & Joint Surg 37 A 580-584 June, 1955.

than 25% of normal and motion was quite painful No evidence of cord or root compression was noted

White blood cell count ranged from 5 000 to 6 000 The blood culture grew S choleræ suis on several occasions, but it was never recovered from the stool or urine Repeat x rays studies showed destruction involving the inferior border of the 4th and the superior border of the 5th lumbar vertebrae, with some loss of disk space.

The effect of chloramphenicol on the course of the infection was not striking However with the addition of a plaster jacket incorporating both thighs, symptomatic improvement was almost immediate. He was discharged to a convalescent home where he remained for several weeks. When seen about 10 months after onset, he had no local tenderness or muscle spasm in the spine and range of motion in anteroposterior and lateral planes was at least 75% normal He had not yet returned to work.

Spinal Osteomyelitis Associated with Urinary Tract Infections is reported in nine patients aged 49 74 by Ted F Leigh Robert P Kelly and H Stephen Weens[3] (Emory Univ) Batson has proved the presence of numerous intercommunications between the veins of the pelvic organs and those of the vertebral column He postulated that by means of these channels tumors and abscesses of the pelvic organs may spread directly to the spine by passing the caval system Gram negative bacilli play an important causative role in development of spinal osteomyelitis subsequent to urinary tract infection and instrumentation

Roentgen evidence of a lesion in the spine lags behind clinical manifestations by weeks or months Adequate studies of the entire spine should be undertaken when osteomyelitis is discovered at one level Two lesions may involve remote sections of the spine and may manifest themselves at different times

Identification of the causative organism may be accomplished by aspiration carried out under x ray guidance according to the following method

TECHNIC.—The patient is placed prone on the x ray table and anesthetized and an area on the back near the lesion in the spine is cleansed and draped. The skin is punctured with a 15 gauge, 3½ in. stainless steel spinal needle directed anteriorly and obliquely inward toward the lesion in the vertebral bodies and disk. Without change in

(3) Radiology 65 334-342, September 1955

the patient's position, 8×10 in. x rays are made in posteroanter and lateral projections. These are immediately processed and studie Further adjustments of the needle and additional films are made necessary Aspiration is done and the aspirated material is cultur and studied microscopically

Tomography is an important adjunct to the study of oste myelitis of the spine Minimal lesions that are obscure ar *equivocal on routine roentgenograms may be revealed* c tomograms

Is Separation of the Central Portion of the Anterio Superior Margin of a Vertebral Body Clinically Importan

W Leger[4] (Univ of Cologne) reports 37 cases with one c



Fig 110 —Same separation of the margin in different projections. Sickle-shap form shown on right. (Courtesy of Leger W Arch. orthop. u. Unfall-Chir 47 15 172 1955)

two anterior margin separations Only one separation was i the thoracic spine one was in the sacrum and all others wer in the lumbar spine X ray diagnosis can be made in latera projections with exact centering of the central ray The typ cal roentgen appearance of separation of the margin is show in Figure 110 There are several types of dislocation of th separated fragment The pathogenesis is uncertain In nin cases the intervertebral disk space was narrowed. There i no certain association with trauma. Besides an acciden

(4) Arch. orthop u. Unfall-Chir 47 159-172, 1955.

some local predisposition is necessary, but separation can be seen without trauma. The history in the 37 cases was not characteristic. In only two was it possible to associate the subjective complaints with separation of the marginal fragment.

This abnormality is observed in patients between age 40 and 50 but the lesions are probably present at earlier ages. Osteophyte formation and calcified intervertebral disk must be considered in differential diagnosis. Fracture of the margin of the vertebral body may be differentiated from separation of the margin by association with trauma and compression of the body in the former condition.

Vertebral Osteophytosis: Pathologic Basis of Its Roentgenology is discussed by Edgar M. Bick[5] (Mount Sinai Hosp., New York). This condition is a specific tissue reaction



Fig. 111.—Lumbar osteophytes, late stage, forming bony bridge. (Courtesy of Bick, E. M.: Am. J. Roentgenol. 73:979-983, June, 1955.)

(5) Am. J. Roentgenol. 73:979-983, June, 1955.

to strain which occurs at the areas of insertion of vertebral and paravertebral ligaments into the apophysial rings of the vertebral bodies Strains may arise from many causes ranging from postural imbalance in an obese person to the late effects of compression fractures The list of associated or causative lesions includes compensatory stresses following degenerative changes within the vertebral disk or within the intervertebral articulations The disease may accompany senile osteoporosis Any of these imbalances or specific lesions may be present without osteophyte formation

Osteophytes protrude from the chondro-osseous junction at the periphery of the upper or lower surfaces of the vertebral bodies They may meet along the connecting ligament and form a bony bridge (Fig 111) Osteophytes appear most commonly in the anterior longitudinal ligament, next in frequency along the lateral ligament and least often in the posterior ligament They may involve a single vertebra or may be distributed through several or many segments of the spine In advanced stages osteophytosis may cause pain due to secondary changes

Spondylolisthesis without Isthmus Defect. R. M Potter and J R. Norcross[6] (Northwestern Univ) have seen an increasing number of persons with varying degrees of spondylolisthesis due to erosion of the facet joints in the lower spine by a degenerative arthritic process Erosion of the cartilage and subchondral bone in response to mechanical stress over the years is sufficient in some cases to permit forward displacement of certain lumbar bodies more than 1 cm (Fig 112)

There are a few simple points of differentiation between spondylolisthesis resulting from isthmus defect and that due to degenerative arthritic erosion of the facet joints as demonstrated on lateral roentgenograms When the lesions are clearcut and sharply defined interpretation is not difficult. Often secondary productive bone reaction may overlap the site of defect or erosive change and obscure the local lesion Simple reference to the shift of bodies and spinous processes may permit accurate diagnosis (Fig 113) Both lesions show forward displacement of the vertebral body In spondylolis

(6) Radiology 63 678-684 November 1954.

adults. Sciatic symptoms were found in two thirds of those under 16 in those over 15 the proportion was reversed with two-thirds having pure backache and only one third presenting sciatica Pain of a sciatic character in children under 15 should always suggest the possibility of vertebral slipping

Study of successive roentgenograms of 12 patients clearly showed that progressive vertebral slipping does occur and may be considerable it usually takes place before age 20 and any changes that may be noted thereafter are slight. The shape of the fifth lumbar vertebral body and that of the upper edge of the sacrum taken together are of prognostic value. When the posterior edge of the fifth lumbar body shows a flattening of more than 30% in relation to its anterior edge producing the well known triangular or trapezoidal effect, and the sacral plateau is the shape of a dome increased slipping may be expected This prognosis holds good even in the presence of a paraspinal lumbosacral graft

Results in these cases show that although lumbosarcal arthrodesis by the posterior route cannot arrest the slipping process it relieves the pain Backache and sciatica disappeared in two thirds of the patients and many were able to do more or less heavy work without inconvenience. Relief from pain usually accompanies good consolidation of the graft. In more than half the patients with pseudarthroses on the other hand backache persisted Surgery should be restricted to patients in whom pain persists despite conservative treatment Fixation by the anterior route may be tried in young girls in whom progressive spondylolisthesis may cause obstetric complications but whether the slipping can definitively stopped by this procedure is uncertain. Reduction by tract[illegible] as been generally disappointing It was tained in [illegible] but maintained in only one

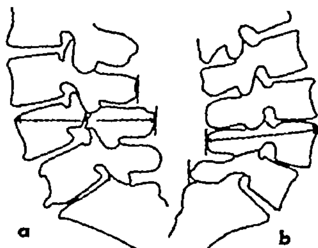


Fig 113.—Tracing of lateral x-ray of lumbar spine showing typical forward displacement of body of 4th lumbar resulting from isthmus defect (a) and from erosion of facets by degenerative arthritic process (b) (Courtesy of Potter, R. M., and Norcross, J. R. Radiology 63 678-684 November 1954.)

differentiation if the aforementioned criteria are observed and one has films of good technical quality and examines them carefully.

Spondylolisthesis in Children and Adolescents W Taillard[7] (Zurich) made a clinical and radiologic study of 50 children and adolescents aged 5-20 treated for spondylolisthesis between 1920 and 1952 in an effort to obtain answers to the following questions (1) Is slow and progressive vertebral slipping really the mechanism of spondylolisthesis and if so when does it occur and at what age is the condition definitively acquired? (2) What is the late prognosis of spondylolisthesis in children? (3) What results can be obtained with lumbosacral grafts implanted by the posterior route?

Lumbosacral arthrodesis was performed on 47 patients all of them were examined on many occasions after operation in 11 successive check ups extended over 10-30 years The patients divided evenly as to sex, had either spondylolysis or spondylolisthesis with or without lysis Spina bifida was present in 21 and the history of 14 showed a more or less violent trauma Most of the signs and symptoms were those found also in adults but one sign sciatic pain seemed to be much more important in these young patients than it is in

(7) Acta orthop. scandinav 24 115-144 1954

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Spondylolisthesis, Its Cause and Effect. P H Newman[8] studied over 200 patients with spondylolisthesis and divided the cases into the following groups I luxation at the lumbosacral junction due to congenital sacral defect including the articular facets with attenuation of the neural arch II luxation of the anterior part of the vertebra due to attenuation

(8) Ann. Roy Coll. Surgeons England 16.305-323 May 1955

or a break in the pars interarticularis or a combination of both, the facets remaining intact, III, luxation due to an acute fracture of the neural arch IV luxation due to degenerative joint changes causing facet deficiency and V luxation due to bone disease

Group I shows essentially a luxation forward of the last lumbar vertebra due to a defect in the development of the upper part of the sacrum The lumbosacral disk becomes useless and degenerate and eventual stabilization of the body is often achieved by anterior buttressing from or fusion with the body of the sacrum The defect in the sacrum is often difficult to see by x rays because of the superimposed vertebral bodies and abnormal position of the downward displaced spine of the last lumbar vertebra closely resembling a sacral spinous process The upper part of the sacrum may be inclined forward to an abnormal degree giving an increased lumbosacral angle and the appearance of a caving in of the lumbosacral area as a whole

Group II the most common differs essentially from group I in that there is no deficiency of the facets The inferior articular facet remains in correct anatomic relation to the superior facet below At operation the posterior part of the neural arch is found prominent posteriorly and loose whereas the one above has slipped forward

Group III is small. The cause in this group is immediate traumatic fracture of the neural arch which later allows forward luxation

Changes in group IV almost invariably occur at the 4th 5th lumbar level and always in middle aged or old persons with severe osteoarthritis of the articular facets Five patients were operated on and in every one the facets of the vertebra above had slipped between the facets below due to severe degeneration of the joint surfaces. In none was there a break in the neural arch

In group V instability is due to bone disease Of the four patients in this group two had Paget s disease, one tuberculosis and one achondroplasia

Spondylolisthesis is due to lumbar instability caused by (1) congenital absence of the sacral ridge associated with deficiency of the median raphe of the lumbodorsal fascia and

other posterior spinal ligaments (2) congenital or acquired facet deficiency, and (3) acquired deficiency of the lumbodorsal fascia other posterior spinal ligaments and the intervertebral disk

Surgical Treatment of Spondylolisthesis without Spine Fusion Excision of Loose Lamina with Decompression of Nerve Roots is reported by Gerald G Gill John G Manning and Hugh L White [9] Most patients have radicular symptoms besides local ache and tenderness in the lumbosacral area Careful neurologic examination usually reveals involvement of the 5th lumbar and sometimes of the 1st sacral root Surgical exploration has consistently revealed nerve root compression by a mass of fibrocartilaginous tissue at the defect in the pars interarticularis of the 5th lumbar vertebra Movement of the loose lamina may also cause nerve root and dural irritation and compression

The authors stress the importance of decompression in treatment They analyzed the results of decompression in (1) patients treated initially by excision of the loose arch and decompression alone, and (2) patients who had had previous unsuccessful attempts at fusion and were treated by decompression consisting of excision of the entire fusion mass and of the inferior articular process

In the first group were 14 patients all had positive neurologic findings and lower back pain The pain was mild in three patients in whom sciatica was the most marked symptom After surgery only three had back pain radicular pain was more frequent Neurologic difficulties were completely relieved in 12 None of the patients had further forward displacement of the involved vertebra upon the sacrum

Each of the four patients in group 2 had a pseudarthrosis between the 4th and 5th lumbar vertebrae and between the 5th lumbar vertebra and the sacrum There was little motion between the vertebrae. In two patients the fusion mass had overgrown the lamina and had sunk in causing compression of the dura In one other ligamentum flavum had remained after a previous exploration and had formed a mass causing dural compression In each instance besides thorough decompression of the nerve roots by excision of the fusion

(9) J Bone & Joint Surg 37 A 493-520 June, 1955

The collapsed vertebra is able to regenerate into a normal vertebra The inferior protovertebra seems to recover its autonomy of growth and replaces the partially destroyed vertebra.

[Unless tubercles and tubercle bacilli were obtained on biopsy of this lesion, few experienced orthopedic surgeons would accept the diagnosis of tuberculosis. The roentgenograms reproduced in the article show changes typical of those in biopsy proved cases of eosinophilic granuloma of the vertebrae.—Ed]

Psychiatric Factors in Low Back Pain are discussed by Joseph D Sullivan[2] (Inst for Crippled and Disabled New York) The onset of back pain may coincide with psychic trauma Illness death of a child change of job or residence or some other psychologic experience may have occurred shortly after or before the disease or injury responsible for the back pain and may act as a conditioned stimulus even when the physical causes subside.

If the psychic trauma precedes the injury the low back pain may be due to flight into illness in which case hospitalization operation physiotherapy and exercise have little value Unless the source of frustration is removed or the patient is given new hope, he will remain ill. Psychotherapy does not directly influence the physical findings but it attempts to deal with the sources of frustration

A psychologic factor that often delays recovery is the fact that the patient finds it isn t at all bad to have a bad back—unexpectedly he finds himself the center of the family s attention Another common reaction occurs when a pre-existing illness is discovered subsequent to the injury but this fact is not accepted by the patient

Back pain is often encountered among psychotic patients Many ambulatory schizophrenics recognize that they are not well and seek medical reassurance in indirect ways If they consult a physician because of back pain and he prescribes physiotherapy or exercise, they become convinced that their psychiatric status is not apparent

Many patients with back pain have demonstrable physical pathologic changes responsible for pain and, in addition neurotic problems Symptoms may wax and wane and often it is apparent that emotional factors play a role but it is next

(2) New York J Med. 55:227 232, Jan. 15 1955.

to impossible to evaluate the effectiveness of psychotherapy in such conditions

Pubic Osteitis J H Weggelaar[3] (The Hague) reports a case

Patient complained of difficulties in walking and sitting and pain in the inguinal region, perineum and inside of the thighs seven weeks after removal of a urinary stone by the suprapubic route. Examination showed a firm tumor, the size of a fist, above the symphysial region it

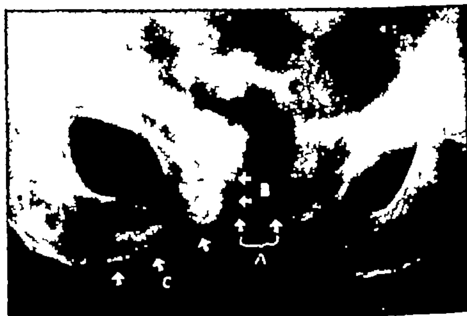


Fig 114—*A* widening of symphysis. *B* locally pronounced osteoporosis with tendency to U-shaped defect *C* destruction along inferior ramus on right. Changes on left still not marked. (Courtesy of Weggelaar J H Arch. chir neerl. 7:124-130, 1955)

was immobile and painful when palpated. There was marked pressure pain in the right tuberosity of the ischium. X rays showed pronounced widening of the symphysis, osteoporosis and rarefaction of the trabecular structure of the surrounding bones (Fig 114) X ray treatment had little effect on pain cortisone was then given The symptoms of pubic osteitis gradually decreased in severity but there was no x ray improvement instead, the osteoporosis was increased The patient died a few months later of a coronary infarct. At autopsy the pubic bone showed chronic nonspecific osteomyelitis and periostitis. Post mortem x ray examination of the pubic bone suggested advanced restoration. There was partial fusion of the pubic bones

(3) Arch chir neerl 124-130 1955

Osteitis of the pubic bones occurs in a small number of cases after an operation in the region of the bladder and the prostate In exceptional cases it occurs without a preceding operation e g., after an external injury or pyelonephritis It may spread to the hip joint Radiologic manifestations appear some time after onset of clinical symptoms The condition finally heals spontaneously clinical symptoms disappear after 4-12 months *Treatment should be aimed primarily at* alleviation of pain

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THE NECK SHOULDER AND ARM

Cardiac Pain in Cervical Osteochondrosis Samuel J Lang and Joseph Tarkington[4] point out that chronic cervical intervertebral disk injuries with resultant osteochondritic changes may produce pain solely in the chest and must be differentiated from cardiac pain Unlike angina cervical root pain usually occurs at night or at rest and is generally relieved by some type of muscular exertion or at least by a change of position The location distribution and severity of the pain may be identical Crushing substernal pain may also be due to cervical spine disorders Severe cervical root symptoms may be present in the absence of demonstrable x ray changes Furthermore symptoms in cervical disk disturbances may be evanescent and may disappear spontaneously for months or years even though the radiologic appearance becomes more pronounced or remains unaltered.

The authors report data on six patients hospitalized because of acute, severe substernal pain indistinguishable from the pain of acute myocardial infarction and followed for two to five years. Onset in all was sudden and associated with varying degrees of shock pallor cold perspiration and anxiety All required opiates for relief In none was evidence of coronary disease discovered and in all the cervical spine showed changes on x ray study In one instance, pain was

(4) Quart. Bull. Northwestern Univ M. School 29 162-168, 1955.

relieved promptly and constantly by nitroglycerin over four years

Conservative therapeutic measures have not been uniformly effective in osteochondrosis Often the discomfort persists or recurs until spontaneous recovery fortuitously intervenes or the discomfort becomes so severe and so refractory to symptomatic treatment that surgery becomes mandatory

Synostosis of Cervical Vertebrae in Osteochondrosis is discussed by K F Schlegel[5] (Univ of Munich) Synostosis along the spine is common, in most cases being the final healing stage of infections most commonly tuberculous processes. Less common are the congenital synostoses that are

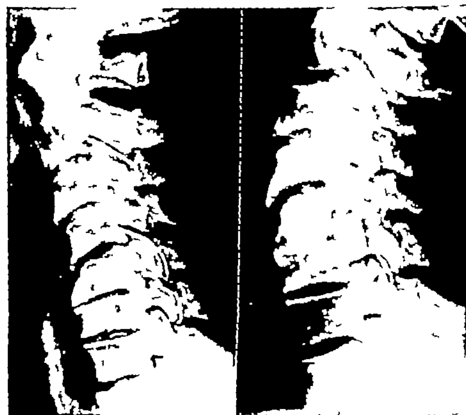


Fig 115 (left) —Severe spondylosis and osteochondrosis of 4th to 6th cervical vertebrae essentially unchanged after two years

Fig 116 (right Progression of degenerative vertebral changes five years later (Courtesy of Schlegel, K F Fortsch Geb. Rontgenstrahlen 83 373-377 September 1955)

(5) Fortschr Geb Rontgenstrahlen 83 373-377 September 1955

probably due to absent or incomplete segmentation of the spine Synostosis may also follow certain injuries to the spine when the intervertebral disk becomes severely traumatized and degenerated

Chondrosis intervertebralis a degenerative process of the intervertebral disk may also lead to synostosis as seen in the following case

Man, 56 fell on his occiput and back. Immediate severe neck pain did not stop him working Two years later he had neck pain mostly on moving his head, and paresthesias in his hands. Neurologic examination revealed restricted motion of the painful cervical spine and minimal decrease in strength of both arms. The x ray films of the cervical spine were essentially the same as those taken six weeks after his injury There were no signs of traumatic changes in the vertebral bodies or the intervertebral disks (Fig 115)

Five years later significant changes were seen on x rays. The fifth and sixth cervical vertebrae had fused completely (Fig 116) and even tomograms could not reveal any remnants of the disk between them. As before urine and blood were normal and no signs of a focal or other infection were noted.

This case history suggests that spondylosis deformans and chondrosis intervertebralis may lead to complete destruction of an intervertebral disk with subsequent synostosis of the vertebral bodies

Luxation Fractures of Odontoid Process of Epistropheus Peter Wurnig[5a] (Univ of Vienna) reports three cases and discusses particularly clinical and x ray diagnosis

Case 1 —Man, 58, fell on the back of his head and was unconscious for a few minutes. Fracture of the 4th cervical vertebra was diagnosed but plaster was not applied because of cardiac symptoms. Five months later paresthesia appeared in the right arm and progressed to paresis, with increasing occipital headache Because of indefinite abdominal symptoms and dysphagia, carcinoma was suspected, but it was not found. Examination disclosed a luxation fracture of the axis with bone wide displacement of the fragment and anterior subluxation. The vertebral canal was narrowed from 20 mm. to 6 mm. Neurologic diagnosis was Brown-Séquard paralysis due to injury of the cervical spinal cord. Reduction by manipulation was attempted, without success, and the patient died, two months after hospitalization and seven months after original injury Autopsy showed an ununited luxation fracture of the dens epistrophei and bronchopneumonia.

(5a) Arch. orthop. u. Unfall-Chir 47 50-55 1955.

Case 3—Woman 66 fell on her forehead and was unable to move for a short time She immediately noted marked paresthesias in the left arm and severe neck pain Examination the same day showed slight paresis of left arm and fracture of the dens epistrophei with bone-wide posterior displacement and subluxation of the atlas. The vertebral canal was narrowed from 22 to 13 mm (Fig 117) Bed rest and 3 kg traction with parallel slings relieved symptoms after nine weeks At follow up four years later head turning was limited by pain and occipital neuralgia and slight weakness of the left arm persisted but there was no paresthesia.

Mild symptoms shortly after injury in relation to marked displacement of the fragment are typical of these fractures which may remain unrecognized throughout life. Kienbock collected 57 cases with 18 deaths 12 of which were late (to 2½ years after injury) mostly due to secondary displacement of fragments by slight trauma He also reported observation of a patient who had been well and without handicap for 17 years and then died after slight secondary trauma In some instances as in Case 1 late death may result from long continued spinal cord compression

Many patients are ambulatory on admission to hospital and display relatively slight symptoms hence the true diagnosis may not be suspected Because the upper cervical spinal canal is especially wide, dislocations of the atlas-axis joint cause less injury to the spinal cord than do those of lower vertebrae The dorsal branch of the 2d cervical nerve between atlas and axis ending as the major occipital nerve accounts for frequent occipital neuralgia Since movement between atlas and epistropheus is principally rotary around the axis of the epistropheus the main anchorage involves the odontate process Hence with direct horizontal trauma it breaks first, without necessarily tearing the relatively loose lateral ligaments of the atlantoepistropheal joint. These fractures almost always heal with only connective tissue. This faulty healing combined with delayed diagnoses may account for the many late deaths

The history in these cases is almost always of a direct but apparently slight trauma to the forehead or back of the head followed by severe neck pain accompanied by muscular fixation and instability of the head Neurologic symptoms are varied and inconstant mo t common is occipital neuralgia

Pareses and paresthesias of the arms vague digestive symptoms and other neuralgias (e g sciatica) dysphagia and obstructed nasal breathing are frequent

Even though overlying structures may make x ray delineation of a fracture difficult this can usually be done by indirect means The odontate process and body of the epistropheus correspond normally to the height of two cervical vertebrae and anterior contours of vertebral bodies lie roughly in one line The almost straight posterior wall of



Fig 117 —Posterior fracture-dislocation of adontoid process. (Courtesy of Warnig P : Arch. orthop. u. Unfall-Chir 47 50-55 1955)

the pharynx directly overlies the anterior surfaces of the vertebral bodies All transverse processes of posterior vertebral surfaces lie in a curved line. In a luxated fracture of the epistropheus the upper portion of the posterior pharyngeal wall bulges forward considerably in its midst is seen the anterior atlas curve and below the separated fragment of the odontate process definitely in front of the anterior row of vertebrae With displacement posteriorly relationships are reversed (Fig 117) When the epistropheus is not the normal height of about two cervical vertebrae, diagnosis of a luxation fracture of the odontate process is practically certain If the x ray is apparently negative, the fracture may

still be recognized on clinical examination External pal| tion of the neck especially in obese patients is usually ı satisfactory but vertebral bodies can be palpated direc through the posterior pharyngeal wall and the displac fragment and bulging caused by hematoma can be rec(nized This examination is too often omitted on the ba of x-ray findings

Chronic and Late Cervical Myelopathy (Compression a Sclerosis of Cord) Following Unrecognized Atlantoax Fracture-Dislocations is reported in two cases by J E. Pa las J Legre J Pellegrin and J Bonnal[6] (Marseille)

Woman, 31 had motor difficulty in both upper and lower extre ities At age 12 after a fall on her head she had paresis of the lim particularly on the right, which regressed well except for persiste



Fig 118—Tomogram cut t 12 cm from dorsal surface. *Ax* indicates axis *OC* lateral mass of occipital bone *C* the *OD* odontoid process arrow fracture (Courtesy f Paillas, J E et l Neuro-chirurgie 1 76-84 1955)

(6) Neuro-chirurgie 1 76 84 1955

difficulty in walking At age 28, she fell again she did not lose consciousness but was unable to rise due to paralysis affecting predominantly the right arm and leg Shortly afterward she regained partial use of the extremities and was able to walk with support. Twenty seven months after the second accident, she had gross functional difficulty of the extremities particularly on the right There was no sphincter difficulty or torticollis, but a pain like an electric discharge was noted on anterior flexion of the head. Examination disclosed bilateral pyramidal tract signs, predominantly on the right. Fine movements (threading a needle, sewing) were not possible All reflexes were hyperactive There were marked sensory difficulties. Sustained ankle clonus and a positive Babinski sign on the right were present. X ray examination revealed posterior dislocation of the atlas on the axis with the anterior arch of the atlas exactly occupying the place of the odontoid process which had been fractured at its base and forced posteriorly into the dural canal (Fig 118) Laminectomy with removal of the odontoid process and decompression was followed by a good recovery

The second patient a man 54 had many similar and typical features

Isolated Paralysis of Serratus Anterior Muscle. Paralysis may come on immediately after a hard blow or after a chronic strain of the neck and shoulder regions First, aching or burning discomfort of varying degree occurs in the neck and shoulder The pain may radiate down the arm or toward the scapular area This is followed by inability to raise the arm properly and by winging of the scapula usually accompanied by inability to abduct the arm beyond 90 degrees

J T H Johnson and Henry O Kendall[7] (Baltimore) report on 20 patients aged 9-50 evenly distributed as to sex The right side was involved in 18 patients Duration of symptoms at first visit was from 1 week to 1 year the average being 17 weeks Etiology included acute and chronic trauma and postinfectious postpartum and postinjection complications

Strength of the serratus anterior at first visit averaged 10% At six months in six patients treated with the scapular cup type brace average serratus anterior power was 90% in two treated with the canvas brace average was 80% and in two treated by physical therapy alone average was 85%

(7) J Bone & Joint Surg. 37 A 567 574 June, 1955.

Whiplash Injuries of Neck were studied by Otis E. James Jr, and Herbert A Hamel[8] (Kansas City) They are caused by sudden involuntary motions of the neck Etiology is almost the same in every instance Occupants of a parked or decelerated vehicle suffer sudden hyperextension of the cervical spine when the vehicle is struck from the rear Soft tissue injury is almost inevitable after such injuries The capsular tissues and ligaments are probably all involved Undue stretching tearing or relaxation produces local muscle spasm and pain Subluxation of the cervical vertebrae is also possible from injury to the ligaments and may alter the size of the intervertebral foramens When subluxation occurs, tendency toward nerve root compression increases

Symptoms and findings are variable Basic cause of pain is probably nerve root irritation In 66 patients duration of symptoms varied from one day to two years and averaged three months All patients had neck pain and variable degree of stiffness Headache was common Commonest physical finding was limited motion Sensory impairment was noted in 30% of the patients X rays often showed straightening of the normal cervical lordotic curve

Severe early injuries should be treated by cervical traction physical therapy and medication Ambulation in a cervical collar scheduled periods of traction at home and supervised physical therapy often prove effective Intractable injuries with definite signs of nerve root compression may require myelograms and even surgery

The condition is self limited Average time for symptoms and findings to subside is three months after which amount of residual disability is negligible

Anterior Scalene Syndrome Re-evaluation of Signs, Symptoms and Treatment. Ward W Woods and Paul A Shea[9] (San Diego Calif) reviewed preoperative symptoms and signs and postoperative results in 90 patients with an anterior scalene syndrome The syndrome was predominant in females on the left side most of whom were aged 30-50

Pain numbness and tingling in the arm and hand were characteristic complaints Focal suprascapular pain lateral thoracic pain and occipital headache associated with posteri

(8) Missouri Med 52 423-426 June, 1955.
(9) West. J Surg 63 682-685 November 1955

or neck pain, were sometimes present The most valuable diagnostic sign was production of symptoms by digital pressure over the anterior scalene muscle on the affected side Onset was most often spontaneous When trauma was the cause, it was often a whiplash injury type

Electromyography was a valuable diagnostic aid in detecting brachial plexus involvement when diffuse denervation fibrillation potentials were found in the affected arm and hand It also can differentiate the syndrome from the cervical nerve root compression syndrome If pressure by the anterior scalene muscle is predominantly on the subclavian artery little or no electromyographic abnormality is found

Section of the anterior scalene muscle alone resulted in complete or good relief of symptoms in 78% of the patients

[The anterior scalene syndrome is merely a complex of symptoms. It is not in itself a disease entity Pressure from a tight or fibrotic anterior scalene muscle can produce both nerve pain and arterial compression, with circulatory changes in the upper extremity However the role played by the anterior scalene muscle is secondary to some other disease or pathology in the neck or shoulder area. This could be arthritis in the cervical spine, a cervical rib, sprain of ligaments with swelling or a neoplasm involving the cervical spine area. The group of cases described by the authors as having spontaneous onset would in all probability if analyzed sufficiently to make a definitive diagnosis, be found to be secondary to other pathology in the neck.—Ed.]

Correlation of Cervicobrachialgias and Roentgenologic Findings in Cervical Spine was investigated by Juha Tapiovaara and Olli Heinivaara[1] (Univ of Helsinki) The causes of pain in the shoulders and upper extremities are divided into four groups (1) diseases of the pleura, pericardium or diaphragm which may by way of the phrenic nerve produce pain radiating into the region of the upper extremities (2) diseases of the central nervous system including tumors of the spinal cord and certain organic diseases of the central nervous system such as syringomyelia (3) diseases of the cervical portion of the vertebral column such as tumors fractures osteoarthritis and prolapse of an intervertebral disk, and (4) conditions of the shoulder joint and its surroundings and of the cervical rib and the scalenus syndrome. The latter two types are the most common etiologic factors in the cervicobrachialgias

The authors took x rays of the cervical spine of 107 pa

(1) Ann. chir et gynaec. Fenniae (supp. 5) 43 436-444 1954

tients over 40 with cervicobrachialgia, and of an equal number of control subjects over 40 who had never had similar pains The findings were negative in 17 of the patients with pain and in 29 of the controls Narrowing of the intervertebral foramen was somewhat more frequent in the former series No differences were found between the two groups with regard to other pathologic findings in the x rays With increasing age, the incidence of completely negative roentgenographic findings decreased in both series

Pathologic x ray findings in association with cervicobrachialgia are not necessarily evidence of etiologic correlation between the two conditions the results of the clinical examination should be given preference over the x ray changes

Office Care of Chronic Pain in Arm and Hand is discussed by Lewis Cozen[2] (Los Angeles) Most painful afflictions of the hand and arm are readily handled without hospitalizing the patients

Ganglions may occur on all sides of the wrist and pain varies considerably A ganglion will often disappear spontaneously so treatment is indicated only in the painful ones Excision should be done only after several aspirations have failed to prevent recurrence Painful Heberden s nodes can be helped by hydrocortisone injection into the joint. This treatment seems to have supplanted physiotherapy

Treatment for stenosing tenosynovitis of the flexor tendons is local injection of 0 5 cc. hydrocortisone The patient should limit use of the hand as much as possible while being treated If hydrocortisone fails surgical incision of the tendon sheath is indicated In osteoarthritis of the first carpometacarpal joint there is pain on motion in all directions It responds readily to hydrocortisone injections A metal splint padded with felt will help in severe cases

Vague but severe chronic pain in the elbow may be caused by epicondylitis of the elbow joint. The condition is treated by rest of the involved hand and injection of 0 5 cc. hydrocortisone into the soft tissues adjacent to the lateral epicondyle

The cervical rib syndrome occurs mostly in women pain

(2) GP 12 75-84 October 1955.

is unilateral and worse at night A tight scalenus anticus muscle will give exactly the same clinical picture To tell if the muscle is pathologically tight the seated patient should turn the head to the side being tested Then, while the patient takes a deep breath, the radial pulse should be felt. Marked diminution or obliteration of the pulse is significant of the syndrome Treatment for these conditions includes proper rest and nutrition and exercises

Median nerve compression in the carpal tunnel occurring more frequently in women is characterized by pain in the thumb and first two fingers Cessation of activity and a wrist splint for the palm of the hand to the elbow should be tried as treatment.

Pressure on one of the lower cervical nerve roots by an arthritic spur is a frequent cause of pain in the neck and arm Similar symptoms accompany a ruptured cervical intervertebral disk. Trauma to the neck is a frequent factor in the onset Treatment of both conditions consists of traction immobilization in a collar hot compresses massage and exercises In severe cases surgery may be necessary

If there is greatly restricted motion of the shoulder without x ray evidence of destructive disease diagnosis of adhesive capsulitis or frozen shoulder may safely be made. Cortisone orally 100 mg a day for a week will often hasten convalescence and exercises are important.

Cervical Disk, Shoulder Arm-Hand Syndrome. Winchell McK. Craig and Joseph A. Witt[3] (Mayo Clinic and Found) point out that the shoulder hand syndrome may follow any condition that produces pain in the shoulder It was first attributed to coronary occlusion but is just as likely to follow tears in the rotator cuff of the shoulder fracture of the humerus with prolonged immobilization intramedullary tumors of the spinal cord protruded cervical intervertebral disks gallbladder disease or periarteritis nodosa First the pain appears then stiffness of the shoulder mostly due to disuse develops

After onset of pain and stiffness there may be a latent period of days to months before vasomotor and trophic changes appear in the hand At first these are mild consisting

(3) Postgrad. Med. 17:267-279 April, 1955

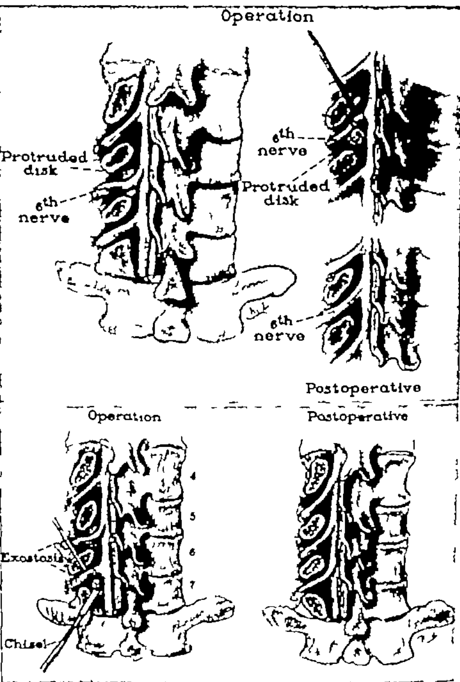


Fig 119 (top) —Removal of cervical intervertebral disk by hemilaminectomy with decompression of nerve root

Fig 120 (bottom) —Relief of osteogenic compression of nerve root by hemilaminectomy

(Courtesy of Craig, W M and Witt, J A. Postgrad. Med. 17:267-279 April, 1955.)

of painful swelling of the entire hand with stiffness of the skin and loss of wrinkles Vasodilatation usually is present in this early phase with increased surface temperature and sweating If the process goes unchecked vasodilatation gradually disappears the hand becomes pale and dry sometimes cyanotic, the skin is stretched taut and trophic changes appear In the final stages the small muscles of the hand become atrophied and deformities and contractures appear

If a protruded cervical disk is the initial cause of painful shoulder conservative treatment consisting of heat massage and traction on the neck is tried first If there is no improvement or the neurologic deficit progresses surgical intervention is indicated (Fig 119) If a ridge on a vertebra compressing the nerve root or if osteoarthritic narrowing of the intervertebral foramen leads to the root pain surgical decompression can be carried out with removal of the lamina on the involved side (Fig 120) Enough bone should be removed to allow adequate decompression of the nerve root as it passes through the intervertebral foramen

Good results have been obtained with (1) repeated procaine block of the stellate ganglion on the affected side, (2) parenteral administration of cortisone or ACTH or both (3) injection of hydrocortisone into the affected shoulder joint and (4) surgical removal of the stellate ganglion and upper thoracic sympathetic chain

Whichever method is selected all patients require salicylates to relieve the pain graduated and supervised physical therapy and encouragement.

Management of Cervical Disk and Cervical Arthritis Syndromes is described by David A Cleveland[4] (Marquette Univ) Cervical arthritis is usually limited to a segment of the cervical spine. Proliferative changes frequently are secondary to disk degeneration and to mechanical derangement of the cervical spine A common cause of cervical arthritis and cervical nerve irritation is the whiplash injury Automobile accidents in which the car stops suddenly may force the head to snap forward and backward in acute hyperflexion and hyperextension As a result the capsular ligaments of

(4) Postgrad. Med. 18:99-105 August, 1955

the vertebrae may be stretched or torn, resulting in sublu
tion spur formation or nerve root compression

While pain and stiffness in the neck are the most frequ
symptoms pains may radiate to the head shoulders or a
as a dull ache or a sharp, shooting pain, and numbness
tingling may follow Headache starting in the back of



Fig 121 – Reversal f normal cervical curve, with calcified spurs encroach
on neural canal between fifth and sixth cervical vertebrae. (Courtesy of Clevel
D A. Postgrad. Med. 18 99-105 August 1955)

neck and radiating up the side of the head to the eyes m
be a symptom of upper cervical injury and nerve root co
pression X ray films will show narrowed intervertebr
spaces loss of the normal curve and encroachment on t
neural canal by spur formation (Fig 121)

Traction and physical therapy generally are the most ben
ficial treatment and hospitalization with continuous tracti
for up to two weeks is desirable Following hospitalizatio
the patient is given intermittent traction for 10 minute pe

ods three times a week During and following the period intermittent traction postural exercises and training are i portant

When adequate physiologic nonsurgical treatment is us ufficiently early surgery is seldom necessary However c ection of persistent sympathetic dystrophies by upper sy athectomy is advisable and extruded disk fragments quire surgical removal Traction frequently aggravates th ymptoms Nerve root compression due to calcified spu ften can be relieved only by decompressing the nerve r y removing either its bony roof or the calcified spur oth

Shoulder Hand Finger Syndrome as a Whole has, acco ng to Erik Moberg[5] (Gothenburg) two components t houlder component and the hand finger component. T yndrome usually begins with only one of them The sho der component may be produced by immobilizing the sho der joint, as for fracture reduction. But even keeping the a alongside the body in bedridden patients may be enough cause contracture of the shoulder The hand finger com nent is first manifested by edema most prominent dorsa over the metacarpophalangeal and proximal interphalang joints The knuckles lose their ordinary outlines and creases grow less distinct Later the skin becomes thin at phic, indurated and shiny The edema may be caused b wound in the hand, but it may also be caused by damage central or peripheral neurons and paralysis without any rect injury of the hand. If an elderly person uses one of hands less than usual (e.g., because of contracture of shoulder) this is enough in itself to cause edema.

The hand component does not always follow upon c tracture and adhesions in the shoulder nor the shoulder c ponent upon the hand lesions However it is often possi to find a trace of the shoulder component in the early sta of the hand finger component, and vice versa, though first component may still not trouble the patient.

In most cases the outlook is favorable for the shoulder the hand component has progressed to the point where edema has been converted to scar tissue and the ligame

(5) Acta chir scandinav 109.284-292, 1955

have grown much shorter the outlook is poor and no treatment can restore the hand to normal

In early stages the shoulder contracture and flexion defect in the fingers usually respond well to active exercising the patient is told to lift both his arms at once and to clench and unclench his hands In advanced cases there are obstacles in the way of free movement—e g adhesions in the shoulder and shortened ligaments in the fingers which the patient himself cannot overcome Each needs its own local treatment. The shoulder contractures must never be loosened under anesthesia. Shortening of the ligaments in the finger joints can be treated by cautious stretching with elastic bands attached to a glove. Manually executed passive manipulation in the finger joints is nearly always dangerous and brisement force still more so Paralyzed muscles can be temporarily replaced with passive measures for example the flexors in the fingers can be replaced by traction with elastic bands If an arm is paralyzed at the shoulder, the other arm can be used to support it in the lifting exercises

When there is causalgia special measures are needed to relieve the hyperalgesia and abnormal reactions in the sympathetic nervous system

Diagnosis and Surgical Therapy of Chronic Midline Cervical Disk Protrusions Eric T Yuhl Duke Hanna Theodore Rasmussen and Richard B Richter[6] (Univ of Chicago) present data on 32 consecutive patients operated on for the syndrome of chronic spinal cord compression due to long standing midline cervical disk protrusion or ridges Weakness of the extremities occurred in each patient Paresthesias of varying severity and extent were noted by 21 Ataxia was sometimes the principal complaint and was reported by 18. Fifteen patients had minor complaints of pain usually nonspecific in the neck suboccipital region shoulder or arm

The principal neurologic findings were upper motor neuron type of paresis of the legs with varying degrees of spasticity and ataxia The cerebrospinal fluid protein was normal in 15 patients 50-89 mg/100 cc in 12 and 90-134 mg/100 cc in 3

The evidences of disk degeneration and repair seen on the

(6) Neurology 5 494-509 July 1955

plain cervical spine films frequently could not be correlated with the myelographic evidence of encroachment on the spinal canal Myelography however accurately predicted the findings at operation Protrusions were multiple in 30 of the 32 patients Although in most instances the anteroposterior projection was most valuable in others the lateral projection was more reliable

Surgery consisted of posterior decompression removing a sufficient number of laminae so as to include at least one lamina below the lowest ridge and one lamina above the uppermost ridge and section of the dentate ligaments throughout the exposure.

Twenty seven patients were followed with repeated neurologic examinations for eight months to five years Ten were objectively improved and 15 have had no increase in neurologic deficit and their progressive spinal cord lesion apparently has been arrested

It seems probable that in the past many patients with a diagnosis of primary lateral sclerosis progressive spinal multiple sclerosis chronic degeneration of the spinal cord due to arteriosclerosis atypical amyotrophic lateral sclerosis etc., may have had a low grade mechanical compression of the ventral aspect of the spinal cord due to midline cervical disk protrusions or ridges

Physiologic Mechanism of Referred Shoulder Tip Pain was investigated by F S A Doran and A. Hall Ratcliffe[7] (Manchester Univ) Irritation of the central part of the diaphragm supplied by the phrenic nerve produces pain over the insertion of the trapezius muscle into the posterior border of the lateral one third of the clavicle and the medial margin of the acromion In reported theories regarding the mechanism of the referred pain the integrity of the terminal nerve endings of the supraclavicular branches of the third and fourth cervical nerves in the skin of the shoulder area is an essential factor

Block dissection of the neck for excision of secondary malignant glands removes all the supraclavicular cutaneous nerves arising from the cervical plexus In a patient who has undergone such an operation stimulation of the phrenic

(7) Brain 77 (pt. 3) 427-434 September 1954

nerve on that side of the neck should not cause shoulder tip pain, because there are no cutaneous endings to generate impulses from the body surface.

A patient of this type was chosen for testing The phrenic nerve was exposed and stimulated electrically Every time the test was applied the patient felt sharp pain in the anesthetic shoulder tip area.

The authors concluded that the autonomic nervous system plays no part in production of shoulder tip pain in man and also that a constant flow of subliminal impulses from the skin of the shoulder tip area to the common pool of neurons in the third and fourth cervical segments of the spinal cord is not an essential part of the mechanism It follows that in some way the phrenic nerve is able to cause shoulder tip pain.

Further experiments indicated that impulses from the diaphragm and from the shoulder tip area terminate in a common group of spinal cord neurons The neurophysiologic phenomenon of summation occurs between the impulses originating in the phrenic nerve and those from the supraclavicular cutaneous nerves However this summation is not essential to production of referred shoulder tip pain

Pain is always felt in the shoulder tip area because only the superficial tissues have distinct cerebral representation the diaphragm having none cannot reach consciousness as an independent entity

Osteoarthritis Deformans of Luschka Joints A J E Cave, J D Griffiths and M M Whiteley[8] (London) believe that a deforming osteoarthritis of the joints of Luschka (neurocentral joints) is the commonest mechanical cause of cervical nerve root irritation The Luschka joints are bilaterally and obliquely disposed paradiarthroses situated between the axis and third vertebra and between each of the succeeding cervical vertebrae. By permitting movements of lateral flexion and rotation they give the neck its characteristic mobility The cervical intervertebral foramen is essentially a short canal bounded ventromedially by the Luschka joint dorsolaterally by the contiguous cervical articular pillars and intervening zygapophysial joint and superiorly and inferiorly by the relevant intervertebral notches (Fig 122) The inter-

(8) Lancet 1 176-179 Jan. 22, 1955

vertebral foramen is large relative to its contained spi nerve it is also occupied by small entrant arteries an abu dance of veins and much soft extradural fat

The characteristic lesion is an "osteoarthritic" deform of the neurocentral joint, with consequent bony encroa ment on the intervertebral foramen and a compression an lation of the contents of the foramen The articulating s



Fig. 122 (left) —Normal cervical spine showing capacious intervertebral fora Fig. 123 (right) —Luschka joint osteoarthritis showing protrusions of apoph osteophytes into four intervertebral foramens.
(Courtesy of Cave, A. J. E., *et al.* Lancet 1 176-179 Jan. 22, 1955.)

faces concerned are generally distorted enlarged and spla laterally toward or into the medial end of the interverte canal (Fig 123)

In all of a series of patients with signs and symptom cervicobrachial neuritis lateral oblique films of the cerv spine showed some encroachment on the intervertebral fo mens by osteophytes from the Luschka joints (Fig 1 However not every neck with radiologic evidence of Lusc joint arthritis gives rise to symptoms.

The Luschka articulations are constant and normal tures of the cervical spine. They are commonly affected

osteoarthritis in the fifth or sixth decades The disease always tends to distort the intervertebral foramen with or without involvement of its contents The neuritis supposedly resulting from lateral herniation of the intervertebral disk is attributable rather to angulation irritation or compression of the cervical spinal nerve by an osteoarthritic Luschka joint.

[Although the average American reader will not be familiar with some of the terminology used in this article and will no doubt not recall having ever heard of the term Luschka as applied to the apophysial joints of the cervical spine, this is an article which should be read and studied. A physiologic and pathologic explanation of the neck shoulder and arm syndrome can be better understood after a review of the anatomy and pathology of the cervical spine as it is contained in this paper —Ed.]

Post Traumatic Dystrophy is classified into four stages by J Bonnet[9] (Leiden Univ) who studied 100 cases The first stage is characterized by vasodilatation hypertrichosis finely spotted decalcification of bone and warm dry edematous skin the second stage by vascular lability and a corresponding fluctuation in clinical manifestations the third by constant vasoconstriction and resulting atrophy of all tissues and the fourth a rest stage by normal circulation and manifestations regarded as residual from preceding stages

Therapy instituted early gives best results In the first stage satisfactory results can be obtained by immobilizing the extremity with a zinc sulfite bandage, a mitella or a plaster cast Passive motions and massage should be avoided however in mild cases active motion exercises under continuous supervision are permitted For the lower extremities either a walking cast or rest in bed is indicated

In cases with marked pain points local procaine injections may result in striking improvement When marked trigger points are absent or local procaine injections give no results in a few weeks sympathetic block often leads to marked improvement The addition of epinephrine to 1% procaine solution prolongs and enhances the effect of the procaine.

In 15 patients injection was made in the stellate ganglion in the second stage with good results in 6 Ganglionic sympathectomy resorted to only in the most serious cases gave striking results in six of seven cases

According to Bonnet the dystrophy results from changes

(9) Arch. chir neerl 7 37-44 1955

in the sensitivity of the blood vessels to central stimuli under the influence of local and regional reflexes caused by the trauma. These reflexes may originate particularly from the injured capsules and ligaments of the smaller joints

Articular Replacement for Humeral Head. Charles S Neer II[1] (New York) used the following technic in 12 cases

TECHNIC.—A Vitallium prosthesis (Fig 124) is used the articular portion of which is shaped like a normal humeral head except for the

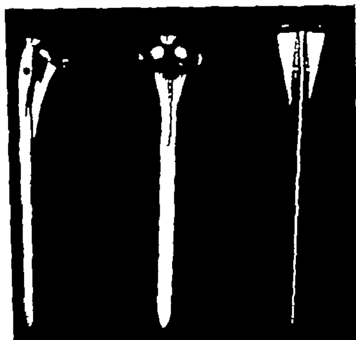


Fig 124.—Replacement prosthesis small, medium and large models shown in side, front and back views, respectively (Courtesy of Neer C. S., II J Bone & Joint S rg. 37-A.215-228, April, 1955)

superior surface, which is flattened to permit seating the prosthesis into the greater tuberosity The edges are lipped all the way around. A three flange mechanism at the neck adds fixation and eliminates rotation. A hole is placed in the neck so that, in fresh fracture-dislocations the fragments of the tuberosity can be held together and to the prosthesis. The stem diffuses strain over a 15 cm. span. The prostheses are constructed in three stem sizes. Different appliances for the right and left sides are not needed however the surgeon must remember that the normal humeral head faces posteriorly about 20 degrees. The proper amount of retroversion can be readily selected if the two

(1) J Bone & Joint Surg 37 A.215-228, April, 1955

epicondyles are palpated at the elbow and the head is turned about 20 degrees from their plane.

The operation is performed with the patient in the "barber chair" position, with head and knees raised 30 degrees. The incision is made lateral to the coracoid over the deltopectoral interval, beginning at the clavicle and passing downward 12.5 cm. The cephalic vein is ligated and removed. The anterior portion of the deltoid is reflected from the clavicle by sharp dissection, enough tissue being left on the

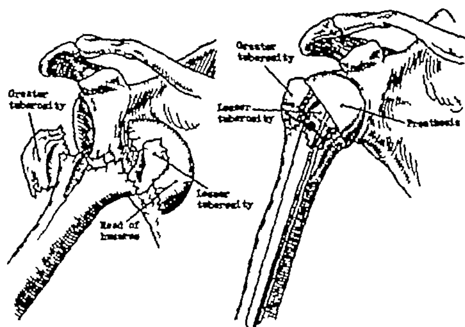


Fig. 125 (left).—Drawing of typical fracture-dislocation. Head, detached, lies outside capsule, greater tuberosity is pulled back by the external rotators, and lesser tuberosity is displaced medially by subscapularis.
Fig. 126 (right).—Wire loop repair holding fragments together.
(Courtesy of Neer, C. S., II: J. Bone & Joint Surg. 37-A: 215-228, April, 1955.)

clavicle for reattachment. The arm is placed in full external rotation so that the subscapularis tendon is brought into view; the tendon is secured with a stay suture and then divided from the lesser tuberosity. In a fracture of the lesser tuberosity division of the subscapularis is unnecessary; the biceps tendon acts as a guide. The capsule is opened transversely. (In an old fracture the anterior half of the capsule should be divided.) The head is placed into the incision by external rotation and prying with a blunt elevator; this brings the entire articular surface into view. The articulating dome is excised with a broad osteotome. The biceps tendon is detached from the glenoid and drawn out from its groove. The center of the medullary cavity is found by

making a small opening in the neck and probing This opening is enlarged to the size of the stem. Three thin osteotomy cuts are made in the cancellous bone for the three flanges. The prosthesis can then be pushed halfway in by hand after which the set for the Judet appliance is used to seat the device completely Before final seating the rotatory position of the head is checked by palpation of the epicondyles. Recent fracture-dislocations consistently follow a four fragment pattern, as shown in Figure 125 Through the hole in the neck of



Fig. 127 —Joint four months after operation—arm at side and overhead. (Courtesy of Neer C. S., II J Bone & Joint Surg. 37 A:215-228, April, 1955)

the appliance the tuberosities are secured to the prosthesis as they are approximated (Fig 126)

Closure includes reattachment of the subscapularis suture of the biceps and repair of the detached portion of the deltoid. If the capsule is thickened and shortened, no attempt is made to repair it. The deltoid and pectoralis fall together and the skin is closed loosely After operation the arm is placed in a sling and swathe, and exercises are begun 48 hours later

The procedure is illustrated in the following case.

Woman 54 had a fracture of the neck of the left humerus with avascular necrosis of the humeral head. Examination 33 months later

revealed 10 degrees of painful glenohumeral motion with a fixed internal rotation deformity of 20 degrees A replacement operation was done, and on the following day she remarked that "the old pain is now gone.' Within 10 days she regained 90% of shoulder flexion. The x ray appearance of the joint four months later is shown in Figure



Fig 128.—Movements 23 months after replacement procedure. (Courtesy of Neer C. S. II J Bone & Joint Surg. 37 A.215-228, April, 1955.)

127 and the range of motion 23 months after surgery is seen in Figure 128.

A tendency to inferior subluxation of the prosthesis was observed after operation in four patients but this disappeared as soon as muscle tone was regained There were no other complications except a superficial wound infection in one patient and there were no dislocations.

Role of Orbicular Ligament in Tennis Elbow is discussed by David M Bosworth[2] (St Luke s Hosp New York) who states that although this lesion is commonly seen and usually amenable to conservative treatment surgery is necessary for relief in a few cases Of 27 patients operated on for this condition after conservative treatment all returned to their original occupation although with variable complaints and findings.

It is believed that the orbicular ligament is important in production of the pain experienced in tennis elbow Resection of this ligament or its displacement downward around the neck of the radius accompanied by division of the common origin of the extensor muscles gave complete relief in five

(2) J Bone & Joint Surg 37 A 527 533 June 1955

patients Experimental removal of the orbicular ligament alone with resuture of the common origin gave complete relief in three patients and in another relief equal to that afforded by simple division of the common origin alone with removal of the fringe between the head of the radius and the capitellum Recovery from soreness of the incisional area has been less rapid when resuture of the common origin has been done. Removal of a section of the orbicular ligament in a patient with malunited fracture of the head of the radius gave relief of pain and resulted in markedly increased joint motion It is probably better to divide the common origin of the extensors completely and to remove the orbicular ligament leaving the head of the radius covered merely by adipose tissue and skin integument

Resection of the orbicular ligament alone may be found sufficient to alleviate the symptoms of tennis elbow

[During the last five or six years, I have resected the orbicular ligament when operating for tennis elbow and in most cases have found a buttonhole split of the ligament. Results of the operation have been excellent and support the theory presented by Bosworth.—Ed.]

Incapacitating Contracture of Elbows Following Intravenous Infusions is reported by Henry Goodwin Glass and Edward T Smith[3] (Houston)

Man, 61 totally maintained nutritionally and therapeutically by the intravenous route, received 35 infusions in antecubital regions, equally divided in each arm. No blood transfusions were given He had well developed veins. No hematomas, thrombophlebitis or lymphangitis occurred. Three weeks after discharge, he was unable to straighten the arms. The right arm showed 60 and the left arm 30 degrees of extension. Both arms could be completely flexed. Palpation revealed a small hard nodule about 2 × 2 × 2 cm in each antecubital fossa in the area of the biceps tendon. X rays revealed ossification in both antecubital fossae. After x ray treatment and physical therapy he had almost complete return of function.

Probably not the variety of solutions used but multiplicity of venipunctures recurrent vasospasm and subclinical vascular and tendon irritation led to the contracture. Ossification might have been caused by recurrent trauma.

Aseptic Necrosis of Capitellum of Humerus Panner's Disease. Jean Lange[4] (Univ of Oslo) reports a case.

Boy 10 was seen because of pain and stiffness of the right elbow

(3) Surgery 37:803-805 May 1955
(4) Acta chir scandinav 108 301 303 1954

for two months. The right arm was flexed 30 degrees at the elbow joint. From this position he flexed 70 degrees. Pronation and supination were normal There was tenderness to pressure on the volar aspect of the radiohumeral joint. Roentgenograms showed an irregular form and structure of the capitellum of the right humerus (Fig 129) Fragmentation was distinct and best seen in the lateral view



Fig 129 —Aseptic necrosis of capitellum of humerus in full development two months after onset of symptoms. Fragmentation and flattening of epiphysis. (Courtesy of Lange, J Acta chir scandinav 108 301-303 1954)

During the reparatory process, articular function gradually improved. In one year the flexion contracture of 30 degrees has been reduced to 7 degrees and flexion amplitude had increased from 70 to 120 degrees. In two years there was full extension and flexion without pain in the elbow

The cause of Panner's disease is unknown The course is benign and leads to epiphysial regeneration in ½ 1 year with moderate or insignificant deformity as the final result. Immobilization is recommended until there is marked regeneration of the epiphysis

Evaluation of Results of Digital Flexor Tendon Grafts in 300 cases is presented by Joseph H Boyes[5] (Los Angeles) Far better results were noted in digits without scar and with good joints indicating that primary treatment of injured tendons should be such as not to add to scarring and that joints should be kept supple if secondary operation is to have a fair chance

The palmaris longus tendon when present is almost ideal for a graft It is usually of adequate length, small in caliber and even when slipped out through two small incisions in the forearm has a thin filmy layer closely adherent to the tendon. When the parts are scarred there is perhaps more need for an extra paratenon layer

Results of flexor tendon grafting in the digits are best when tissues are least damaged when a full length graft is used and when exacting technic is followed. Under these conditions in 25% of all patients flexion of the pulp of the finger will reach the distal crease of the palm in 50% flexion will occur to within ¼ in and in all to within ¾ in

Results of Tendon Suture of the Hand Review of 500 Patients. M Foss Hauge[6] (Drammen, Norway) re-examined 500 patients with 724 tendon lesions of the hand for which primary and secondary tendon suture had been done. Most flexor tendon lesions were due to saw blade injuries most extensor tendon lesions to axe injuries

Results of primary sutures of flexor tendons were extremely poor in no man s land " i e. the region from the insertion of flexor digitorum sublimis to the distal line in the hollow of the hand or that part of the hand where both the superficial and deep finger flexors have a common tendon sheath. This was equally true distally to no man s land Otherwise results on the flexor aspect of the hand were relatively good On the extensor aspect of the hand and fingers results after primary suture were strikingly good, even if the lesion was accompanied by capsule injuries and simple fractures Secondary su

(5) Am. J Surg 89 1116-1119 June, 1955
(6) Acta orthop. scandinav 24.258-270 1955

tures gave no better results whether the tendon was a flexor or extensor

Hauge suggests that as a rule in departments of general surgery, primary tendon suture should not be done in no man s land and distally to no man s land Surgeons may carry out primary tendon suture proximally on the flexor aspect of the hand and in most extensor tendon lesions

Post traumatic Rupture of Extensor Pollicis Longus Tendon—Pathogenesis and Treatment Survey Based on 208 Cases, Including 14 Personal Cases Gunnar Strandell[7] (St. Göran's Hosp Stockholm) classifies subcutaneous ruptures



Fig 130 —Appearance of thumb in rupture of extensor pollicis longus tendon. (Courtesy of Strandell, G. Acta chir scandinav 59 81-96, 1955)

of the tendon of the extensor pollicis longus as follows rupture immediately after direct or indirect trauma and spontaneous rupture (1) of unknown etiology (2) following occupational microtraumas ("drummer s palsy"), (3) following tendon diseases and (4) post traumatic.

Analysis of 208 cases of post traumatic rupture revealed that two thirds were in females In over three fourths of the patients the rupture occurred within three months after the initial trauma In more than three-fourths the trauma caused a fracture of the radius but displacement was present in only a third. In more than half the females the rupture occurred after age of 50 in three fourths of the males before that age.

(7) Acta chir scandinav 59 81 96, 1955.

tion of pull from the ulnar side The transposition method was used in 13 of the author's 14 cases the extensor indicis proprius was used in 6 the extensor indicis communis in 6 and the extensor carpi radialis brevis in 1 Results could be evaluated in 12 cases they were good in 11 and poor in 1

Barbwire Tendon Suture Clinical Experience with 30 Flexor Tendons is reported by Erwin R Jennings and George H Yeager [8]

TECHNIC.—The tendons are sutured as soon as possible, after routine preparation of the patient. A brachial block or general anesthetic is used. An avascular field is secured by pneumatic tourniquet. Sharp technic is used. In suturing the divided tendon, the needle is first introduced into the substance of the proximal tendon segment, about ⅓ in.

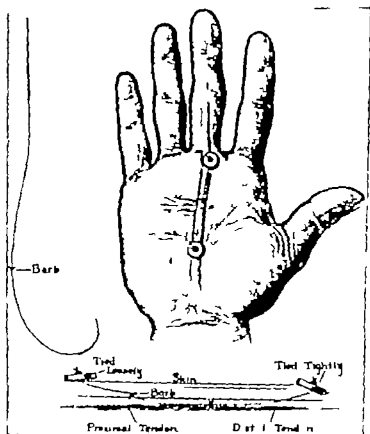


Fig. 132.—Details of suture (left), drawing of hand with suture in place, sagittal view (bottom). (Courtesy of Jennings E. R. and Yeager G. H. A.M.A. Arch. Surg 70 566-569 April, 1955.)

(8) A.M.A Arch Surg 70 566-569 April, 1955.

from the point of severance. The barb is engaged and the needle carried into the substance of the distal segment and out through the skin (Fig 132) The tendon ends are approximated and appropriate tension maintained by a button and lead shot. The proximal portion of the suture is brought out through the skin and maintained loosely on a button. When the tendon is healed the distal button is freed and the suture removed by pulling proximally

The points of severance encountered are shown in Figure

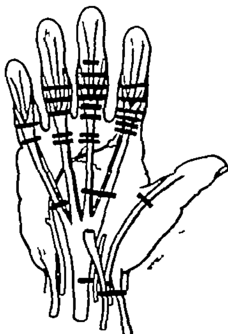


Fig 133 —Points of severance in 30 tendons (24 cases) (Courtesy of Jennings, E. R., and Yeager G. H. A.M.A. Arch. Surg 70.566-569 April, 1955)

133 Of 30 divided tendons 18 gave good results (Figs. 134 and 135) 8 fair and 4 poor Of 22 tendons severed within the flexor digital sheath only 10 showed good results

This technic is easy to use, but certain precautions are noteworthy The barb should be applied with care so as to engage substantially the points within the tendon substance and it should not be engaged too far back on the proximal tendon segment or folding of the tendon will occur If the suture needle is not correct in size or contour it can be bent or another more desirable, needle substituted. In suturing tendons within the phalanges the distal button should be ap-

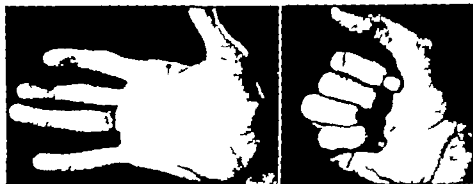


Fig 134 (left) —Extension three months postoperatively
Fig 135 (right) —Flexion three months postoperatively
(Courtesy of Jennings, E. R., and Yeager G H.: A.M.A. Arch. Surg 70.366-569 April, 1955)

plied on the extensor surface of the fingers Several lead shot should be used to secure the suture The distal portion of the suture should be spaced away from joints Early mobilization can be used if the distal button is one joint past the point of severance

Median Neuropathy in Carpal Tunnel is described by Miller Fisher[9] (Montreal) Usually the earliest complaint is numbness tingling or painful burning of the fingers coming on during sleep Rubbing the affected parts dangling the hand over the side of the bed or just holding the wrist straight often brings relief in a few minutes With the pain there is often a sensation of swelling or a feeling of paralysis of the affected fingers which are held in semiflexion The paresthesias lie within the peripheral sensory territory of the median nerve In spontaneous cases pain is uncommon during the day but when occupational trauma or old injury is a factor excessive use may elicit discomfort The pain often extends from the pads of the fingers over the palm to reach the wrist or occasionally the forearm

Within a few months persistent numbness or lack of feeling sometimes appears in one or two finger pads with weakness of the thenar muscles Dishes slip from the hand a needle can no longer be pressed tightly enough to sew Sensory deficit may be prominent

The syndrome affects middle-aged women predominantly

(9) Canad M A. J 71 121 125 August, 1954

Most cases are bilateral In advanced cases fine discrimination on the involved finger pads will be impaired and in the most severe cases, pinprick also

Relief of symptoms is secured by section of the transverse carpal ligament

Repair of Motor Branch of Ulnar Nerve in Palm is described by Joseph H Boyes[1] (Los Angeles)

METHOD —Exposure of the nerve from its origin as a branch of the main trunk at the wrist to its midpalmar portion is best made through a curved skin incision distal and parallel to the thenar crease. The skin is reflected and the palmaris brevis muscle is divided at its insertion (radial side) and reflected ulnarward so as not to disturb its nerve supply Ulnar vessels are retracted toward the thumb when the origins of abductor flexor and opponens digiti quinti are divided and tendons of flexor digitorum elevated, the full course of the nerve can be seen Further exposure of its distal portion can be obtained by extending the incision to the index metacarpal and by elevating in one mass the flexor tendons and lumbrical muscles. With these displaced ulnarward, the nerve can be picked up where it passes through the transverse fibers of the adductor

Gentle freeing of the injured nerve proximally and distally to the point of damage, allows room for suture without tension. In gunshot wounds, or those with loss of substance a rerouting of the nerve (Fig 136) is accomplished. The motor component is split from the trunk well into lower portion of forearm. The volar carpal ligament is then divided and the ulnar bursa, making up the lining of the carpal tunnel is freed from the ulnar side of the carpus The proximal end of the nerve is then displaced into the carpal tunnel and its route shortened. By flexing the wrist, proximal end can be brought to the midpalm. The volar carpal ligament is resutured, and, in closure, normal insertion of the palmaris brevis is replaced. In some cases when branches to the hypothenar muscles are still intact, gentle dissection and splitting off of the intact bundles allow branches to be saved and yet permit rerouting of the nerve into the carpal tunnel

Suture of freshened nerve ends is accomplished by approximating the sheath with interrupted 6-0 silk on small curved cutting needles. Results are proportional to the accuracy of approximation and inversely proportional to the scarring and fibrosis present.

Of 11 patients with complete severance of the nerve distal to its origin 2 had lesions in the main trunk 4 lesions distal to the hypothenar branches 3 damage in the midpalm and 2

(1) J Bone & Joint Surg 37 A 920-924 October 1955.

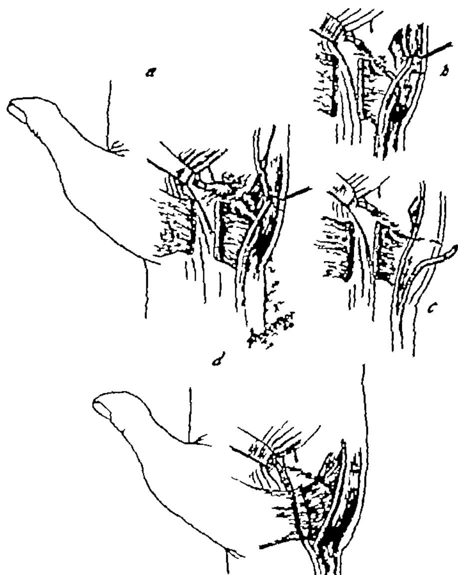


Fig 136.—Method of rerouting motor branch of ulnar nerve through carpal tunnel to allow suturing where loss of substance is present. (Courtesy of Bayne, J H.: J Bone & Joint Surg 37 A 920-924 October 1955)

severance of the nerve at the level of the adductor pollicis. Only one repair was done as a primary procedure at the time of injury others were done 3 weeks to 11 months later Voluntary activity of the first interosseus muscle was present in 10 patients followed at least a year Two with incomplete paralysis due to closed injuries recovered full function in six months One with complete intrinsic paralysis for seven

months recovered in six months when a carpal ganglion attached to the nerve between the pisiform and hook of the hamate was removed

Capsulectomy of Interphalangeal Joints of Fingers Raymond M Curtis[2] (Baltimore) studied 25 patients with limited extension and 25 with limited flexion of fingers result-

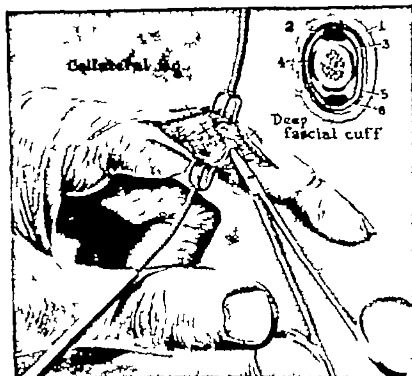


Fig 137 —Capsulectomy of proximal interphalangeal joint. Skin incision is developed down to deep fascial cuff which is lifted with point of scissors to show approach to collateral ligament. Inset shows cross-section of finger at level of base of middle phalanx, with deep fascial cuff extending from extensor to flexor; *1* superficial fascia *2* extensor tendon *3* deep fascial cuff *4* collateral ligament of joint capsule; *5* volar plate of capsule, 6, flexor tendon. (Courtesy of Curtis, R. M. J Bone & Joint Surg 36-A 1219-1232 December 1954)

ing from mechanical limitation at the interphalangeal joints. Limitation of motion was persistent despite conservative treatment consisting of special nonrigid splinting and physical and occupational therapy There were 72 interphalangeal joints subjected to surgery to improve function

TECHNIC.—The interphalangeal joint is approached by a lateral incision (Fig 137) The deep fascial cuff is exposed and preserved so stability in the joint can be maintained after the collateral liga

(2) J Bone & Joint Surg 36-A 1219-1232 December 1954

ments have been excised. The collateral ligament of the proximal interphalangeal joint is best demonstrated by approaching the joint from the base of the middle phalanx and elevating the deep fascial cuff. A block of the ligament is excised on both sides of the joint (Fig. 138). Before closing the wound, 0.5 cc. hydrocortisone acetate is injected into each interphalangeal joint. To maintain the fingers in a partially flexed position at the joint, a fine Kirschner wire is in-

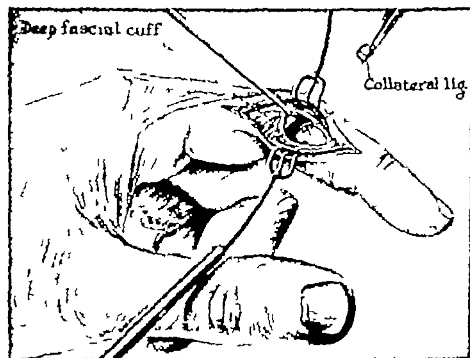


Fig. 138.—Deep fascial cuff has been retracted and block of collateral ligament excised. (Courtesy of Curtis, R. M.: J. Bone & Joint Surg. 36-A: 1219-1234, December 1954.)

troduced into the distal end of the proximal phalanx with the middle phalanx in flexion. In five to seven days the wire is removed and rubber band splinting is started. Splinting is continued until the patient is able to maintain, by active and passive exercise, the range of motion obtained postoperatively. The same operative approach is used in cases with limited extension. Rubber-band splinting is begun immediately when the problem is one of limited extension.

An operative procedure in which a lateral approach is used allows the operator to excise a portion of the collateral ligament from each side of the joint without disturbing the stability of the proximal interphalangeal joint.

The results in this series of patients indicate that when the interphalangeal joint is intrinsically in good condition as shown by x ray measurable improvement by capsulectomy can be expected

Syndactylism occurs about once in every 2 000-2,500 births according to H M Blackfield and D P Hause[3] (Univ of California) As a hereditary character reported as high as 80 and as low as 20% it is dominant in some cases recessive or sex linked in others About twice as many males as females are affected The condition is bilateral in 48% of the patients and in 35% the toes are also webbed to some degree Other anomalies of the extremities are often associated The most common site of webbing is between the ring and little fingers though any or all fingers may be affected Kanavel classified the condition on the basis of degree of severity (1) only skin and subcutaneous tissue involved (2) bony fusion also present most often in distal phalanges (3) and (4) marked departure from normal by skin and bone also tendons joints nerves and vessels The first two conditions require surgical correction In more severe cases operation usually is not practical because reasonable function of digits cannot be expected

There are two generally accepted methods of surgical treatment That described by Norton in 1881 which the authors favor uses proximally based dorsal and volar skin flaps interdigitated to form the commissure at the base of the fingers This method has two minor drawbacks (1) the web is too wide because interdigitated flaps are sutured side by side and (2) the slope of the new web does not appear normal i e., from dorsal to volar and from proximal to distal The normal slope is more nearly approached by Agnew s method in which the web is somewhat narrower The second accepted method is that of Kanavel ("butterfly graft) in which a single full thickness graft is fashioned to fill the entire defect resulting from splitting of the web the graft extending from the tip of one finger to its base across the commissure and out to the tip of the other finger

Even with perfect healing cases operated on by either method often develop flexion contractures along the volar

(3) Plast. & Reconstruct Surg 16 37-46 July 1955

suture lines To prevent this the authors modified the technic by using dartlike flaps cut from the edges of finger defects, one from the volar and the other from the dorsal aspect. These flaps are shifted as in a Z plasty, to interdigitate a dividing bridge of skin across the defect thus breaking the straight line volar closures These flaps are constructed in regions of one or both interphalangeal joints so that full thickness skin and subcutaneous tissues are placed in these

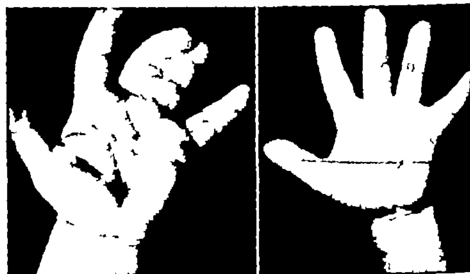


Fig 139 (left) —Before operation
Fig 140 (right) —After operation.
(Courtesy of Blackfield, H M., and Hause D P: Plast. & Reconstruct. Surg 16:37-46, July 1955)

areas Small free full thickness grafts are used to cover the remaining defects

It is generally agreed that the proper age for the separation of syndactylized fingers is four to six years If there is bony fusion or fibrous union of the distal phalanges disproportionate growth may occur and earlier surgery may be indicated (Figs 139 and 140)

Trigger Finger in Adults and Children is discussed by John J Fahey and John A Bollinger[4] (St Francis Hosp., Evanston Ill) During the past eight years 31 adults were treated for stenosing tenovaginitis of the long thumb flexors 34 thumbs were involved Twelve children were treated for

(4) J Bone & Joint Surg 36-A:1200-1218, December 1954

15 affected thumbs Nineteen patients had involvement of 28 fingers other than the thumb

The occurrence of trigger finger in twins appearance of the syndrome at birth or in early childhood and frequent bilateral involvement lend support to the theory that children



Fig 141 (top) —Flexion deformity of left thumb of girl, 7
Fig 142 (bottom) —Tendon nodule in girl, 5 after excision of tendon sheath. (Courtesy of Fahey J J and Bollinger J A J Bone & Joint Surg 36-A:1200-1218, December 1954 from J Pediat. 41 448, October 1952.)

may have a congenital predisposition to this condition When the thumb is involved in children, the condition is frequently confused with congenital contracture or dislocation because the thumb is usually locked in flexion (Fig 141) Snapping is the commonest symptom in adults and when locking occurs it is most often in extension. When locking occurs in either

children or adults it appears to be predominantly in the position of a natural attitude. In the adult digital fibrous sheath involvement is prominent and tendon changes are minimal as compared with the condition in children The palpable mass at the base of the thumb in children is frequently due to tendon proliferation and degeneration, which results in nodular formation (Fig 142)

Conservative management may be tried in adults seen shortly after onset of symptoms. For adults who do not respond to conservative treatment and for those seen late, operative treatment is recommended In children, only operative treatment has been found satisfactory Local excision of the tendon sheath suture of only the skin and encouragement of early motion have given satisfactory results

Fate of Complete Human Finger and Toe Bones Transplanted in Abdominal Fat was studied by Lyndon A Peer and Alvin Mancusi Ungaro[5] (Newark N J) by implanting bones of two fingers and one toe into the abdominal fat of infants and children who had supernumerary digits requiring amputation The nail bed and nail were left on the terminal phalangeal bone the bones were covered with periosteum and the epiphysial cartilages and synovial joint structures were intact (Figs 143 and 144) Eighteen months later the hard jointed structure of the finger and toe implants could be palpated beneath the skin and the bones were freely movable at their joint surfaces During an operation to correct web fingers one abdominal transplant was exposed 19 months after transplantation The bones tendons and joint capsules were all present and the three phalangeal bones could be flexed and extended about 90 degrees The tendons covered by a thin fibrous layer were not fixed in their channels and appeared exactly like normal tendons The nail on the terminal phalanx was firmly attached to its bed but did not appear to have grown lengthwise. The exposed finger was covered again to be removed and examined microscopically later

The findings suggest several clinical possibilities The complete bony structure of amputated fingers with nail and tendon might later be reattached to the stump as a pedicled

(5) Plast. & Reconstruct. Surg 16 16-22, July 1955.

autograft utilizing the overlying abdominal skin for a covering It might be possible to incise the skin in the palm separate the finger skin from the palmar and lateral surfaces of phalanges remove all fat and transplant skin in an abdominal

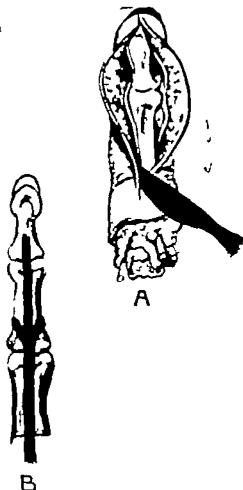


Fig. 141.—*A*, drawing of amputated finger showing removal of skin and subcutaneous tissue. *B* the three phalangeal bones with flexor and extensor tendons, nail intact in nail bed, epiphyseal cartilages and joint capsules—all to be transplanted in abdominal fat. (Courtesy of Peer L. A., and Mancusi-Ungaro, A. Plast. & Reconstruct. Surg 16 16-22, July 1955)

surface wound as a free skin graft with attached bones as buried grafts in fat the nail would be on the surface, where it normally belongs. Later transference of skin and underlying bone to the stump might be done in stages through pedicled attachment and the usual delays so that ultimately the finger

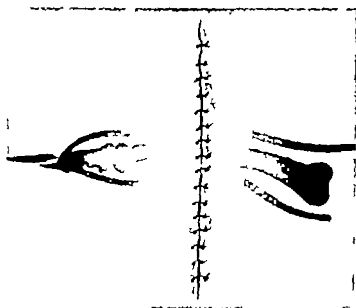


Fig 144 —Composite transplant i place with wound margins sutured. (Courtesy of Peer L. A. and Manccusi Ungaro, A.: Plast. & Reconstruct. Surg 16:16-22, July 1955)

bones would be attached to the hand covered by their original skin covering plus the extra abdominal skin required for complete wrap around coverage. The same principle of using the peeled back skin as a flap and the underlying bone as a buried graft at the abdominal site might be used to transfer a nail bed from a supernumerary finger or toe

Reconstruction of Hand Digits by Toe Transfers Patrick Clarkson[6] (Guy's Hosp London) claims that the method of dorsal flap transfer of a toe is a safe one and that useful function can be afforded the toe on the hand

TECHNIC.—A dorsal flap on the foot of at least 1½×1½ in. based distally over the metatarsophalangeal joint of the toe to be transferred is used for one-digit transfers (Fig 145) The flap is "delayed" in one or two stages. For four or five-digit transfers, virtually the whole of the dorsum of the foot is used again delaying the flap one or two times at two week intervals The larger the flap the more secure from the mechanical point of view is the attachment of the hand to the foot. The foot on the same side as the hand is used. The foot flap is elevated to its dorsal base at the toe or toes. The extensor tendons are divided just distal to the ankle joint and the dorsum of the foot is covered with a skin graft.

(6) J Bone & Joint Surg. 37-A:270-276, April, 1955

To prepare the hand the skin from the dorsum is deflected distally and anteriorly to create a dorsal defect proximal to the digit, or digits, to be restored the area is approximately that of the dorsal flap on the foot.

The extensor tendons of the toes are attached to the distal cut tendons of the missing fingers either on the back of the hand or in the forearm A flexor tendon transfer can be made at the same time Thus the flexor hallucis longus may be cut behind the ankle and threaded through the metatarsophalangeal joint and the thenar eminence and

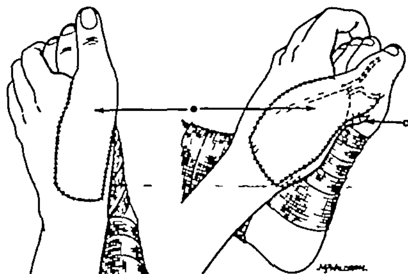


Fig 145—Suture of dorsal foot flap ( ) to dorsal hand defect, with dorsal hand flap (O) lying deeply and turned over distal stump, to be attached to dermatome graft. (Courtesy of Clarkson, P : J Bone & Joint Surg 37 A 270-276, April, 1955.)

wrist. It can then be attached to a forearm flexor motor unit above the wrist. If other toes have been used, the long flexors can be divided in the sole of the foot just distal to the attachment of the accessorius and then threaded through the metatarsophalangeal joints.

After tendon attachment, the hand is sutured under the dorsal flap on the foot. Fixation with the knee and the hip in acute flexion, is by zinc oxide strapping

Later the digital vascular pedicles on each side are divided separately the first side two weeks after the attachment of the flap and the second side two weeks later then the toe is amputated through the metatarsophalangeal joint after a further two weeks. At amputation, when the toe or toes are carried away with the hand, the raw area on the distal portion of the foot is covered with a split thickness skin graft.

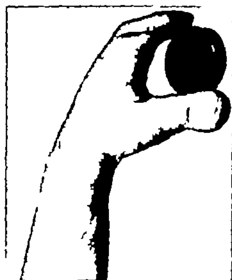


Fig 146—Severe burns in infancy with loss of all digits on left hand, produced a clubhand. Photograph shows hand after transfer of big toe and free grafts on webs and palm. The grip is chiefly between thumb and longest finger stump (third finger). Patient can pick up a safety pin and hold a glass. (Courtesy of Clarkson, P: J Bone & Joint Surg 37-A 270-276, April, 1955)

Remodeling may include thinning of a big toe or deepening of the webs between a big toe transferred as a thumb and the other digits. It may also include tendolyses, tendon grafts and plastic revision to improve appearance.

Clarkson transferred 15 digits in six patients, with loss of half a digit in one 3-digit transfer. The results are well seen in Figure 146.

Rotary Angulatory Osteotomy of Metacarpal Bones in Mutilated Hands. All reconstructive hand surgery aims at maximal restoration of the grip. A good grip, however, requires not only a certain degree of mobility but also normal sensation, at least in the skin areas included in the grip. The essential problem in reconstruction of the hand is thus to create an antipole with sensation and within the reach of the thumb or fingers left. A simple and valuable method of accomplishing this goal is a rotary angulatory osteotomy of the 5th and in some instances also the 4th metacarpal. Lars Önne[7] reports results of this operation in seven cases in which there was almost total loss of grip owing to loss of most of the fingers.

(7) Acta chir scandinav 108 268-274 1954.

TECHNIC.—After a transverse incision dorsoulnarly over the metacarpal region the extensor tendons with surrounding soft tissue are stripped from the 5th and possibly also the 4th metacarpal after which these bones are osteotomized transversely. Initially only the 5th metacarpal was divided as proximal as possible in the area of



Fig. 147.—Bony union following operation. (Courtesy of Onne, L. Acta chir scandinav 108:1468-274 1954.)

cancellous bone. To facilitate rotation, in recent cases it has been considered preferable to divide the bone more distally through the diaphyses, both on the 5th and 4th metacarpals. The distal fragments are angulated and rotated radially as far as possible. One or two Kirschner wires drilled into the distal fragments with attachment to the adjacent nonosteotomized bone, afford reliable fixation. For three to five weeks further *reinforcement is gained with plaster of paris.*

After a couple of months bone union will have occurred (Fig 147) and the wires may be removed

Before operation none of the patients could make contact between the thumb or thumb remnants and the ulnar portion of the hand or ulnar fingers the least width between these areas was 0 5-4 cm Postoperatively these parts could be approximated with comparative ease The active mobility of the osteotomized metacarpal bones was unaffected There



Fig 148 (left) —Before osteotomy
Fig 149 (right) —Good pinch following osteotomy of 5th metacarpal.
(Courtesy of Onne, L Acta ch scandinav 108 268-274 1954)

were no postoperative complications Most patients were back at work within two months Five patients had good results they can grasp objects that are not unduly heavy and handle various tools (Figs 148 and 149)

Mutilations of this type are not uncommon but rarely receive the benefit of reconstructive operations as it is commonly assumed that one cannot improve the function of these mutilated hands Rotary angulatory osteotomy affords invaluable potentialities of obtaining definite improvement and an increased working capacity

Hyperextensibility of Proximal Interphalangeal Joint of Finger Following Trauma. Unhealed avulsion of the palmar portion of the proximal interphalangeal joint capsule leads to

characteristic deformity and disability The finger cannot be fully extended in the normal manner because the proximal interphalangeal joint immediately subluxates into hyperextension and the distal joint falls into partial flexion (Fig 150) Robert B Portis[8] (V.A , Los Angeles) describes hyper-

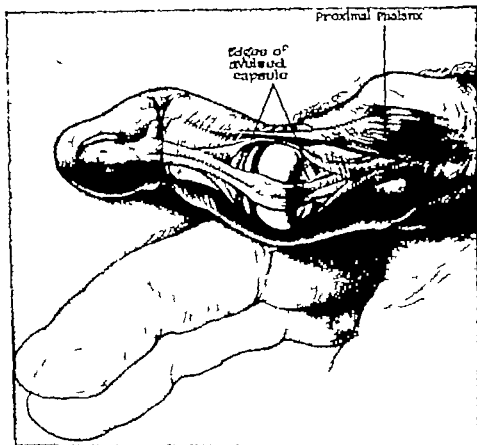


Fig. 150—Pathologic condition with finger in position of deformity note edges of avulsed capsule enclosing portion of head of proximal phalanx. (Courtesy of Portis, R. B J Bone & Joint Surg 36-A 1141 1146, December 1954.)

extension which when active extension of the proximal interphalangeal joint was attempted could be reduced only by external assistance, and the reduction was accompanied by an audible snap Two cases were explored surgically Trauma in the first case occurred when a ball struck the tip of the finger and presumably hyperextended it sharply In the second, the finger was injured by the steering wheel in an automobile accident In both the proximal interphalangeal joint

(8) J Bone & Joint Surg 36-A 1141 1146, December 1954.

was dislocated After reduction, the fingers were treated extension in tongue blade splints for brief periods Immobi zation in extension apparently did not close the defect caus by avulsion of the palmar aspect of the capsule

The best treatment probably is immediate adequate redu tion of dislocation if present, followed by prolonged imm bilization of the joint in moderate flexion Late treatment, necessary consists in suture of the avulsed capsule to t base of the middle phalanx and immobilization and rehabi tation The operation usually should not be done for cosme reasons Indications for surgery are persistent pain a swelling and disabling instability, in selected cases

Immediate Reconstruction of Major Trauma to Han James T Metzger[9] (Delaware Hosp., Wilmington) stat that the role of the surgeon is to evaluate results of immedi or delayed reconstruction of major trauma to the hand wi a view to reclamation of certain basic functions of the ha as a unit The normal attitude and balance of the hand c be noted in every act The wrist is stabilized in moderate e tension and slight ulnar deviation and the thumb is in dire alinement with the radius with its metacarpal at right angl to the palmar plane. All fingers are semiflexed so that t distance from the finger pads to the thumb pad is equal (F 151 *A*) Every reconstructive procedure must accept the r lation and dependence of distal activity on proximal stabili as a primary goal and be directed toward maintaining it present or reclaiming it if lost

The three objectives of reconstruction are wound closu reduction of fractures and maintenance of attitude and ba ance It is difficult to determine whether damaged tissue w survive Errors concern mainly skin flaps and badly damag digits Tendinous nervous ligamentous and joint structur can usually be assumed to have a survival potential and the initial sacrifice is as a rule unwise Neither is it wise to reta a digit from which the neurovascular pedicle has been d stroyed. Sacrifice of questionably viable skin and replac ment by tissue with adequate blood supply is recommende

The commonest wounds not in the crush avulsion bla group involve the tendons Divisions of the extensor mech

(9) Delaware M J 27 1-6 January 1955.

nism offer few problems except when at or distal to the metacarpalphalangeal joint Traumatic divisions are never discrete as with the flexor tendons but involve the dorsal fascia and are associated with interruption of the dorsal interosseous attachment Repair to attain maximal gliding function

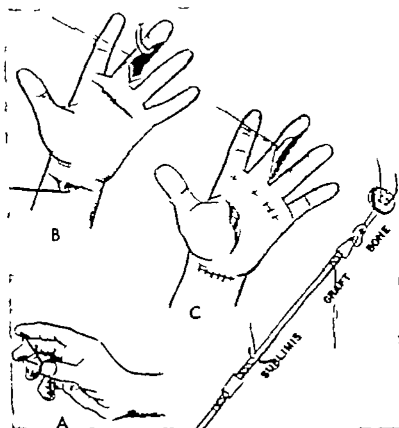


Fig 151.—*A* normal attitude and balance of hand. *B* and *C* method of inserting sublimis tendon as free profundus tendon graft. (Courtesy of Metzger J T Delaware M J 27 1-6, January 1955)

demands meticulous diagnosis of the extent of injury to the tendon and also to the dorsal capsular mechanism

Divided flexor tendons are a problem only when severed distal to the level of the lumbricales The profundus is repaired without difficulty when severed distal to the attachment of the sublimis tendon Repairs are most effective when the sublimis is withdrawn and reinserted as a free profundus tendon graft. Figure 151 *B* and *C* show a palmar laceration in

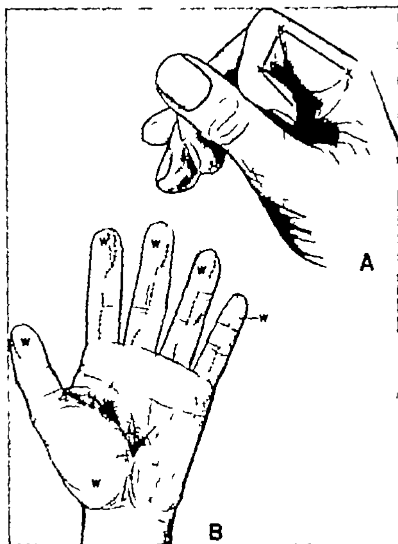


Fig 152 — *A* easy method of determining midlateral finger line by connecting apexes of finger folds Incision made in this line is not subject to contraction *B* working surfaces of hand. (Courtesy of Metzger J T Delaware M J 27 1-6, January 1955)

which both tendons have been divided The sublimis and distal portion of the profundus are divided from their attachments through a midlateral finger incision the line being determined as in Figure 152 *A* The sublimis is identified at the wrist and withdrawn The tendon is then reanastomosed to the profundus at the level of the attachment of the lumbricales and the suture line is buried in the soft tissue of the palm

The graft is threaded through the profundus tunnels to the distal attachment

Surgical repair of injured tendons requires adequate exposure The hand can be freely incised if the basic principle of the working surfaces and their avoidance is remembered (Fig 152 *B*) Midlateral finger incisions should always be on the ulnar side of the 2d 3d and 4th digits but on the radial side of the 5th The working surface of the thumb is radial up to the metacarpophalangeal joint and then becomes ulnar outward along the surface where the thumb and fingers oppose Palmar incisions should parallel flexion creases but not lie directly in them

In crush avulsion blast wounds fractures can usually be reduced under direct vision although an x ray study is essential Final wound closure is usually done by a combination of free graft rotated local flap and direct transfer abdominal flap In resurfacing losses with exposed bone, joints or damaged tendons a full thickness skin flap is required When a local rotated flap cannot be used a subcostal or epigastric abdominal flap is the tissue of choice In general flaps should be cut quite thin and be no longer than twice their width The subcostal flap is used in resurfacing volar defects The epigastric flap is adaptable to closure of dorsal wounds The flap must be cut from the ipsilateral abdominal surface so that the hand lies adjacent to the body rather than across it This position allows normal moderate extension of the wrist and a far more liberal range of motion of shoulder and elbow

Final reconstruction will be minimized by early closure and meticulous care of the original injury

Roller and Wringer Injuries Clinical and Experimental Studies Martin A Entin[1] (McGill Univ) evaluated the factors in the production of injury by wringer and roller machines on laboratory animals and correlated the findings with clinical cases

Microscopically the roller injuries in rats showed marked edema and extravasation of blood into the subcutaneous and subfascial tissues as well as between the muscle bundles in the first day followed by necrosis and ulcer formation of

(1) Plast. & Reconstruct. Surg 15:290-312, April, 1955

and that it is unwise to repair the deeper structures if first aid has been injudicious

Technic of repair is difficult A bloodless field must be obtained with a blood pressure cuff and the wound must be enlarged proximally and distally always to the radial or the ulnar side of the digit The digital nerves must be identified protected and, if necessary repaired After the tendons are identified fine silk sutures are inserted into the tendon which is then drawn through the fibrous tendon sheath and united end to-end If the profundus tendon only is divided it can be united distally to the sublimis tendon If the sublimis and profundus have both been divided, the sublimis is removed because if both divided tendons were sutured there would be three sutured tendons within the confining sheath and adhesions would be inevitable A window of the fibrous tendon sheath about 1 cm in length and directly over the site of the sutured profundus tendon must be removed The tendon sheath acts as a barrier and would prevent the blood from gaining access to the site of union

After the tendons and nerves and the skin and subcutaneous tissues have been repaired a dressing of soft gauze is placed between the digits A voluminous amount of fluffed gauze is added to provide adequate bulk so that compression may be applied to the entire hand and digits The digits are kept in moderate flexion with a sterile aluminum dorsal splint. Splinting must be continued for at least three weeks after operation until the tendon union has matured The operative wound is dressed about once a week.

[The editor was pleased to note that this splendid surgeon of injuries of the hand has recommended that lacerations within the digits involving nerves and tendons be operated on when the interval between injury and surgery does not exceed two or three hours. If the wound is more than three hours old or if first aid has been totally inadequate it is certainly better to postpone definitive repair of the tendon.—Ed.]

Care of Open Injuries of Hand and Fingers with Special Reference to Treatment of Traumatic Amputations Patrick Clarkson[3] (Guy s Hosp London) classifies hand injuries as those due to lacerating violence caused by cutting instruments sharp pieces of metal and glass and (2) breaches of the surface caused by crushing violence which are the open contusions seen after the hand has been caught in power presses,

(3) J Bone & Joint Surg 37 A:521 526, June 1955

doors and hammers Open contusions are more severe than lacerations of the same extent because of higher incidence of damage to bone and other deep structures and because of progressive edema

In breach of the full thickness of the skin, the hand is given full formal treatment in an operating theater Tetanus antitoxin is given to all patients except those who have had the toxoid before or have had allergic complaints Penicillin is given only prophylactically for injuries with gross soiling or when repair takes over an hour

Primary cleansing is done first in a 1% detergent by the patient himself who cleanses the whole limb below the elbow particularly the nails After local analgesia is given a secondary cleansing with a second detergent is done by the operator The chief precaution in use of local analgesia is avoidance of use of epinephrine Routine minimal excision is done in lacerations to produce noncontaminated nonbeveled edges that can be accurately apposed tissue of doubtful viability being left at primary operation

In about 90% of Clarkson s cases simple approximation was the method of wound closure Occasionally thin split thickness skin grafts or cross finger thenar or palmar flaps were used Mean healing rate for lacerations was 8 days for open contusions 17 days and for soft tissue loss nearly a month

The most practicable and certain primary method for general use in repair of traumatic amputation of digits is cover by a thin split thickness skin graft when necessary after anterior shortening of the exposed phalanx This free graft repair is relatively unsightly and poorly sensitized but is much more reliable than a full thickness skin graft cover and its performance needs less experience.

The best repair for common important finger tip injuries is repair by like tissue that is by thenar or palmar flap When properly executed these flaps show no disability in the donor sites and give the best looking stumps and the best return of sensation

Injuries to the Hand in Children Joseph L. Posch[4] (Detroit) reviewed 187 injuries to the hand in children Over half occurred in the first five years of life Broken glass was the

(4) Am. J Surg 89 784-794 April, 1955

main offender burns were the next most common cause Wringer and mangle injuries closely followed burns Diagnostic difficulties due to poor co-operation of the child require observation under anesthesia

METHOD.—First aid treatment consists of compression dressing to

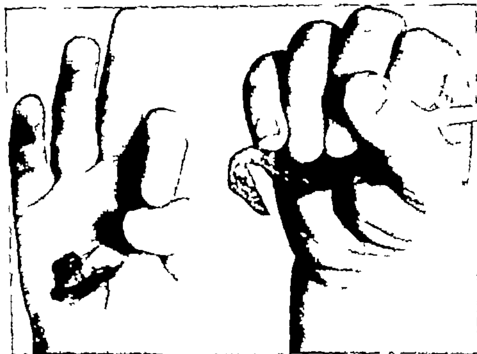


Fig 153 (left).—Girl, 14 months, with severe laceration of palm of right hand and severance of flexor tendons and digital nerves to middle, ring and little fingers; superficial volar arch was cut. Severe bleeding occurred. Primary repair was done 18 hours after inj ry and after adequate blood replacement. Both flexor digitorum profundus and flexor digitorum sublimis tendons were repaired with no. 60 cotton suture material nerves were repaired with 6-0 silk sutures.

Fig 154 (right).—Good flexor power six months after injury There was no limitation of extension, and sensation wa returning to palm and proximal portion of the fingers.

(Courtesy of Posch, J L.: Am. J Surg. 89:784-794 April, 1955.)

control bleeding Surgical procedures should be performed under adequate sedation and anesthesia.

The hand is washed with soap and water for 10 minutes. A blood pressure cuff is used as a pneumatic tourniquet. For adequate exposure a mid lateral incision is made on the side of the involved finger In the palm, incisions are made to follow the flexion creases. At the end of surgery bleeding vessels are ligated with fine cotton suture and the skin edges are closed with interrupted Nylon suture. Fine cotton or silk sutures are used for the tendons and fine silk for the nerves.

Dressings usually extend from the finger tip to the shoulder splints can be fastened to the forearm with adhesive tape. A of paris splint can be molded to fit the dressing securely It is tant to obtain adequate immobilization, often by using a large dressing The length of hospitalization depends on the procedu

Soft tissue injuries may range from small minor c severe avulsion lacerations and even amputation of a m of the hand Application of split thickness skin graft fro upper thigh or forearm is indicated in these cases much skin is missing a pedicle can be raised from the As much length of the digit as possible should preserv

Primary tenorrhaphy can be performed under prope ditions (Figs 153 and 154) Fine suture material mu used and the tendon sheath must be left open Seco tendon procedures are often necessary and tendon gr can be done at any age Posch usually uses the extens dons of the toes The graft is extended from the dista lanx of the finger to the proximal portion of the tend the palm

Burns of the hand are treated with compression dre using petrolatum Skin grafting should be done soon t trol infection

Usually the injured children need no formal physioth Joint stiffening does not occur and adequate motion tained

[The earliest possible definitive care as recommended by this and the use of fine cotton or silk for the suture of tendons and nerves of less reliable absorbable suture material are to be commended. Th dressing firmly bandaged in place not only keeps the extremity qu also greatly reduces post traumatic and postoperative edema. Every cian who is called on to treat injuries of the hands of children will fi article most worthwhile.—Ed.]

Dupuytren s Contracture Statistical Study was cond by John Yost Thomas Winters and Herbert C Fett (Brooklyn) Dupuytren s contracture is a deformity hand resulting from pathologic changes in the palmar neurosis Among 5 062 patients the authors found the c tion in 171 (3 37%) Previous series have shown an inci of 1 13% The ratio of men to women was 3 1 The age patients ranged between 37 and 100 and averaged 68. dence of Dupuytren s contracture in this survey was dit

proportional to the age group of patients examined The left and the right hand were affected in about the same incidence

All 49 patients with involvement of the left hand only were predominantly right handed a fact to be weighed when trauma is considered as an etiologic factor Etiologic consideration of trauma should be limited to those who constantly use such large-handled tools as brooms shovels and picks Incidence of Dupuytren s contracture is far less in Negroes than in whites

Inveterate Volkmann s Syndrome Preliminary Report on Orthopedic Treatment and Surgical Correction of Volkmann s Ischemic Contracture is presented by R. Merle d Aubigne and Tran Ngoc Ninh [6] Although the extent of the lesions produced by ischemia in Volkmann s contracture is extremely variable analysis of symptoms in 12 patients showed its basic characteristic to be deformity of the last four fingers and the wrist. Proper evaluation of therapeutic results depends on an accurate appraisal of the state of the arm and hand before treatment consequently the elements of deformity and paralysis should be considered separately Deformity may be shown (1) in flexion affecting the fingers wrist and elbow (2) in extension of the proximal phalanx and (3) in pronation Paralysis which is usually confined to the muscles of the hand and in some cases the flexors of the fingers, is often definitive and beyond the scope of surgical correction Functional improvement can sometimes be obtained by palliative measures such as muscle transplantation

The purpose of treatment is twofold to correct the vicious positions caused by muscle retraction and to restore power to paralyzed muscles if necessary Various surgical procedures including certain transplantations have been designed to accomplish both purposes at once complex cases however are usually attacked in several stages The first requirement is to secure relaxation of the flexors of the wrist when they are retracted and then to lessen the hypertony of the long extensors a factor which though often overlooked plays an important part in the clawing of the fingers Only when these preliminary steps have been taken can correction of the finger deformity be successfully attempted.

(6) Rev chir orthop. 41:32 55 Jan. Mar 1955.

Orthopedic treatment produces the best results in fairly recent cases whereas in those of more than a year's duration diaphysial resection of the two bones of the forearm is the least unfavorable procedure when perfectly executed. Paralysis that interferes with opposition of the thumb should always be the object of a palliative intervention preferably an arthrodesis Finally, careful re-education centered on the wrist will make use of the hand possible by enabling the patient to acquire the necessary new movements Difficult as the treatment of Volkmann's contracture is results obtained by the authors show that improvement in both shape and function can always be expected if some such plan as this modified to suit the requirements in each case, is painstakingly carried out It should be remembered that a moderate final result in a desperate case may be a greater accomplishment and may mean more to the patient than brilliant correction of a slight deformity

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THE HIP LEG AND KNEE

Traumatic Paralyses of Sciatic Nerve and Its Branches are discussed by Jacques O Ramadier[7] on the basis of 119 cases in which operation was done following injury

Peroneal nerve injuries usually produce a pure motor syndrome and the resultant paralyses are relatively benign. Neurolysis is usually successful if the nerve has not ruptured. If neurolysis or suture which should always be tried result in failure Lambrinudi's procedure alleviates the foot drop and often assures excellent function (Figs 155-157)

Lesions of the tibial nerve are more serious due to the predominance of sensory and trophic changes In such cases neurolysis suture or nerve graft should be tried In event of failure especially in cases in which a syndrome of sympathetic irritation predominates sympathectomy in the form of

(7) Rev chir orthop. 41 177 190 Apr June, 1955

a high lumbar ganglionectomy may considerably ameliorate the state of injury

Lesions of the main trunk of the sciatic nerve are extremely serious when they include fibers destined for the tibial nerve Exploration should be the rule since neurolysis gives 75%

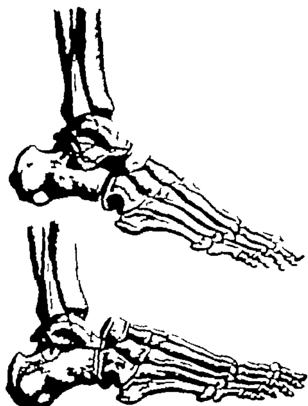


Fig. 155 —Lambrinudi s operation. (Courtesy of Rasmadler J O : Rev chir orthop. 41 177 190, Apr June, 1955.)

successful results or notably ameliorates symptoms A great majority of the failures followed use of a suture or graft However these procedures should be attempted before resorting to amputation In this series amputation was necessary in half the cases of complete nerve section

In cases in which motor symptoms predominate, Lambrinudi s operation or triple arthrodesis seems indicated if there is sufficient plantar sensation and the trophic state is satisfactory High lumbar sympathectomy appears useful espe



Fig 156 (top) —Loss of substance of peroneal nerve due to wound.
Fig 157 (bottom) —Good result with Lambrinudi's operation.
(Courtesy of Ramadier J O Rev chir orthop 41 177 190 Apr June, 1955)

cially in cases with predominately pain symptoms This procedure sometimes avoids sacrifice of the limb

Slipped Capital Femoral Epiphysis according to Michael Bonfiglio[8] (State Univ of Iowa) is characterized by gradual displacement of the capital epiphysis on the neck through the epiphysial plate At times complete separation of the epiphysis is observed after acute trauma. Mechanical, traumatic and metabolic factors and an imbalance of the growth hormone probably combine in development of the displacement.

Symptoms appear between ages 10 and 16 affecting boys about three times more often than girls The children are usually overweight Bilateral slipping occurs in 25-40% of patients About one third to one half of the patients are first

(8) J Iowa M Soc. 45 189 193 April, 1955

seen when slipping is less than 1 cm Symptoms appear insidiously with intermittent limp and pain in the hip thigh or knee anteriorly increasing on exertion

The most frequent physical finding is restriction of internal rotation of the hip Lateral x rays are most useful for showing anterior displacement of the neck and downward displacement of the femoral head Prevention of further slipping and closure of the epiphysial plate can be achieved by immobilization in a hip spica plaster bandage or by internal fixation of the femoral head with a Smith Petersen nail or with threaded stainless steel pins

In moderate to severe slipping symptoms are more pronounced Persistent limp and increasing deformity are commonest complaints The extremity may be shortened up to 1 in., and x rays reveal more displacement of the epiphysis The neck of the femur projects anteriorly and blocks motion as it impinges on the margin of the acetabulum Restoration of anatomic position and prevention of further displacement is achieved by replacement of the head at site of displacement or by subtrochanteric osteotomy The epiphysis is fixed with a Smith Petersen nail or threaded wires

Acute slipping is due to trauma in a normal child or in a patient with previous minimal slipping The patient refuses to walk The limb lies in external rotation and movements are considerably more restricted Manipulation and traction under anesthesia usually complete the reduction before internal fixation If the separation is more than four weeks old open reduction is indicated

Slipped capital femoral epiphysis if recognized and treated early when slipping is minimal has an excellent prognosis

Nature and Treatment of Juvenile Slipped Capital Femoral Ephiphysis Report of Two Hip Arthrodeses Following Extra articular Nailing H Haferland[9] (Hamburg) used extra articular nailing in a girl 12½ with slipped capital femoral epiphysis Normal bone structure was found 2 months after surgery after 10 weeks she went to school and 9 months later the nail was removed. The same treatment was used on two boys 16, with the same condition

(9) Chirurg 26 257 264, June 1955

Both were free from pain and had normal bone structure seven or eight weeks after operation Owing to lack of pain neither patient came for follow up examinations After nine months to one year, in evaluating the hips for removal of the nail complete arthrodesis of the hip joint was found in both boys

Slipped capital femoral epiphysis is due to aseptic necrosis of the neck and epiphysis of the femur Extra articular nail ing acts as a *stimulus to new bone formation In the cases* in which arthrodesis developed there was no evidence of wrong localization of the nail incorrect indication incorrect postoperative treatment or postoperative infection The pos sibility of tissue reaction to the metal with subsequent asymptomatic arthrodesis is considered as a cause of the bad results

Wedge Osteotomy in Advanced Femoral Epiphysiolysis. The operation is performed to minimize traumatization and facilitate open reduction Enough bone is removed from the superior and anterior part of the metaphysis so that the neck can be brought into good contact with the head through in ternal rotation and abduction It is important to spare the periosteum on posterior and inferior aspects of the neck. Central osteotomy is done in the epiphysial cartilage and

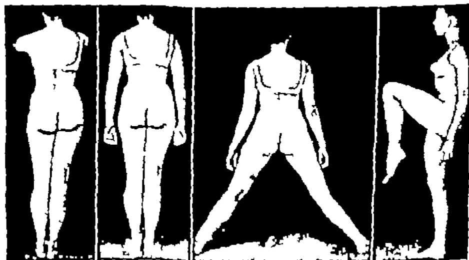


Fig. 158.—Range of motion of left hip nine years after wedge osteotomy and nailing performed at age 12 F action is practically normal, but there is shortening of 2.5 cm. (Courtesy of Hiertonn T Acta orthop. scandina 25 44-62 1955.)













Fig. 159 (top left).—Severe slipping of right epiphysis.
Fig. 160 (top right).—Severe slipping of left epiphysis.
Fig. 161 (center and bottom).—Slipping reduced by wedge osteotomy of neck and fixation with screw.
(Courtesy of Hjertonn, T. Acta orthop. scandinav. 25:44-62, 1955.)

peripheral osteotomy in the metaphysis of the neck The apex of the wedge should be situated somewhat ventrally so as not to break the soft part communications The position is then secured with a nail or screw

Tor Hiertonn[1] (Karolinska Inst Stockholm) reports 41 cases observed for 2 10 years 3 were eliminated from analysis because they showed definite circulatory disorders in the head before operation and later arthroplasty is planned Operation was bilateral in four instances hence 38 operations were performed in 34 patients (aged 10-20) Anatomic and functional results were favorable in 24 (63%) Only two had less than 80 degree flexion All had leg shortening of 1 2.5 cm (Fig 158) In a girl 10 with severe slipping of the right epiphysis followed several months later by severe slipping of the left anatomic restoration was satisfactory after reduction by wedge osteotomy of the neck and fixation with a screw (Figs 159 161) Extensive capital necrosis occurred in five instances and in nine partial capital necrosis and early osteoarthritic changes appeared Nutritional changes in the head usually developed relatively slowly after technical mishaps at operation

Earlier diagnosis permitting a milder form of treatment, should be possible Maximal displacement is often due to repeated slipping Repeated x ray examinations including the Lauenstein projection are important.

Arthroplasty of Hip Joint with Judet s Prosthesis. M Hackenbroch[2] (Univ of Cologne) presents provisional evaluation of results obtained by replacing the deformed femoral head with an acrylic prosthesis Either a small prosthesis for the head only or a large prosthesis for the head and neck is made according to measurements obtained from serial x rays. Fixation of the prosthesis is important to success because the bone becomes necrotic at points of high local pressure from the plastic In this respect a valgus position is better than a normal angle of the neck Diseased bone must be completely removed before inserting the prosthesis as the stump must be able to withstand pressure and the prosthesis can be solidly secured only to healthy bone tissue. Postoperatively motility

(1) Acta orthop. scandinav 25 44-62, 1955.
(2) Deutsche med Wchnschr 80 1282-1287 Sept. 9 1955

is usually good but there is often no improvement in pain Best results were obtained in pseudoarthroses of the neck of the femur and in recent traumatic necroses of the head Poor results were obtained in active inflammatory processes and rheumatoid arthritis

Postoperatively prolonged fixation is important and no weight bearing should be allowed for three months Massage and exercise are important in rehabilitation of atrophic muscles

The widely divergent results reported in the literature are probably due to differences in indications and technics Complications are dislocations and fractures of the femur and particularly postoperative pain from many underlying causes, such as necrosis of the acetabulum muscle spasm arthritic changes and circulatory disturbances Prognosis depends on the primary disease

Acrylic Prostheses in Hip Surgery is discussed by R. Judet[3] In 789 cases in which acrylic hip prostheses were used results were excellent in 241 good in 291 fair in 135 and poor in 122 After a one to two year follow up 84.5% of the patients reported improvement The procedure proved to be a delicate and difficult one requiring good training Besides improper technic or indication the major causes of poor results were atrophy of the femoral neck and necrosis of the acetabulum Complications set in mostly during the first 18 postoperative months rarely between the 18th and 30th months and never after the 30th

In 71 patients repeated surgery was necessary A major procedure was carried out in 40 of these, with arthroplasty repair in 21 arthrodesis in 5 and Whitman s procedure in 14

The resection reconstruction procedure using the Smith-Petersen cup is the most comprehensive endoprosthesis pattern developed so far

Complications of Acrylic Prosthesis F Tejera Lorenzo[4] reviews results of hip arthroplasties in five men and five women (average age 47) Preoperative diagnoses were degenerative arthritis indeterminate arthritis recent intracapsular fracture and old intracapsular fracture. Eleven complications occurred in eight patients with use of Judet s

(3) Rev chir orthop. 41 325-376, July-Sept., 1955.
(4) Cir ortop y traumatol., Habana 19 71-81 Apr June 1955

acrylic prosthesis These included infection with postoperative luxation and death periarticular calcification in two patients pain at the site of protrusion of the stem intolerance and infection in four, fracture of the prosthesis in two secondary varus deformity in one and persistent pain on walking in two The greatest number of complications occurred in patients with intracapsular fracture of the neck of the femur

Results with the prosthesis cannot be considered favorable compared with results obtained in intracapsular femoral fractures treated with a Smith Petersen nail Use of the acrylic prosthesis has been discontinued in all recent fractures except when the patient s condition requires rapid ambulation

Pain has been a constant factor in arthrosis of the hip Satisfactory motion has been obtained Generally speaking, Judet s acrylic prosthesis has not lived up to original expectations

Complications of Judet Arthroplasty Due to Foreign Body Reaction to Nylon Prostheses were observed in seven patients by Louis J Levy Cuvier P Lipscomb and Henry C McDonald Jr[5] (Fort Worth Tex.) In four patients arthroplasty had been performed because of malum coxae in two because of an ununited fracture of the femoral neck with a nonviable head and in one as primary treatment for a high subcapital femoral neck fracture After surgery with insertion of the Nylon prosthesis all had done well initially and during the first several months of convalescence Each patient then began to have pain and progressive limitation of movement in the hip At first roentgenograms showed no signs of bone disturbance but later a mottled destruction appeared in the remaining portion of the neck of the femur, absorption about the stem of the prosthesis and osteoporosis about the acetabulum were noted The more prolonged and severe the symptoms the more pronounced were the x ray findings

At reoperation findings were rather uniform No patient had any evidence of infection The joint capsule was usually only slightly thickened The most dramatic changes were in

(5) J Bone & Joint Surg 36-A 1175-1180 December 1954

the synovial membrane in all but one patient a hypertrophic, yellow caseous appearing villous synovial membrane was present There were varying amounts of bone absorption and destruction primarily in the neck of the femur The head of the prosthesis was roughened nonglistening and worn and flattened on its superior surface The amount of roughening and flattening and the associated synovitis and bone absorption seemed to be in direct relation to the length of time the prosthesis had been in place and the use the patient had given it. Histologic examination in two typical cases showed foreign body reaction

Further Comments on Reparative Surgery of Hip are presented by Ugo Camera[4] (Univ of Turin) His method of biologic arthroplasty performed on nearly 100 patients for osteoarthritis of the hip is based on the belief that the primary anatomicopathologic changes occur in the juxta articular osseous tissues and not as commonly held in the cartilage especially in so-called osteoarthritis of mechanical origin Camera believes that the changes in the cartilage and other nonskeletal tissues are secondary and are maintained by the bone lesion they are not irreversible but will regress to the point of anatomic and functional restoration when the bone lesion is cured

This view is supported by the fact that in many cases when a joint is exposed at operation the cartilage is well preserved even though the capsule is thickened the synovial tissue swollen the cavity filled with cloudy sanguineous fluid and the cephalocervical edge affected by ulceration Treatment therefore consists of removing the diseased bone by subchondral evacuation carried as far as the femoral head and the wall of the acetabulum when necessary then packing the resulting cavities with small chips of spongiosa, which may be autoplastic homoplastic or frozen. These implants stimulate the local biologic reactions by improving nutrition Electric instruments must not be used because they produce thermal and mechanical changes in the osseous bed which alter the trophic capacity of the bone. Because it respects the anatomic conditions in the epiphysis this operation does not interfere with any subsequent repair that may

(4) Minerva med. 45 1379-1398, Nov 28, 1954.

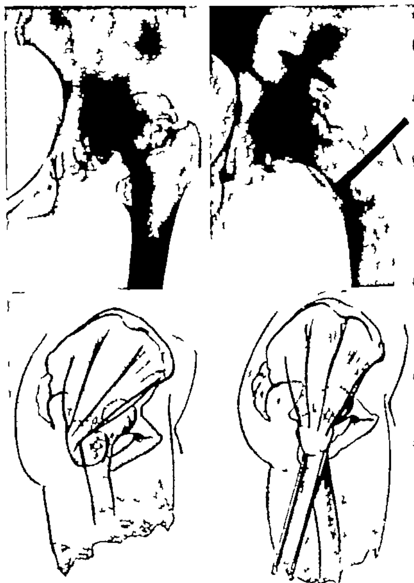


Fig 162 (top) Fig 163 (bottom)
(Courtesy f Camera, U Minerva med. 45 1379-1398, Nov 28, 1954)

be needed The anatomic improvement paralleling the clinical and functional improvement noted in these patients was reflected in x rays made before and after operation.

Since October 1953 Camera has supplemented curative biologic arthroplasty with various other technics designed to improve the static and functional condition of the joint Indications for supplemental procedures are coexisting oste-

phytosis marked deformity of the epiphysis and femoral head and subluxations with deficiency of the roof of the acetabulum Special care is needed in diagnosing extrarotation of the hip Attempts to remedy this defect by plastic procedures on the acetabular roof are useless Figure 162 shows a case in which such a procedure was ineffective Correction is secured by freeing the greater trochanter from the cervicodiaphysial angle not with simple osteotomy but with an intermediate resection of the tuberosity (about 1.5 wide) This resection is intended to lessen the thickness of the trochanter thus facilitating its mobilization and displacement and to provide autoplastic spongiosa for use in packing After mobilization of the trochanter with its muscular insertions internal rotation can be secured with surprising ease and a hip that could only be slightly bent before operation can be bent beyond a right angle Figure 163 shows the correction obtained in a case of osteoarthritis associated with varism In addition to the structural changes produced in the articulation of the femoral head by epiphysial evacuation and packing it shows the results of osteoplasty of the cervicodiaphysial angle and thinning and distal transposition of the greater trochanter This procedure has been definitively adopted for treatment of coxa vara in general

Patients with pseudocoxitis and chronic pseudarthroses of the hip also require careful diagnotic study if the lesions are entirely extra articular surgery should be limited to the pericotyloid focus and be supplemented with antibiotic therapy Streptomycin combined with the operative procedures described has given excellent results in tuberculous coxitis but in this as in other tuberculous conditions prognosis must be guarded

Resection of Proximal End of Femur to Remobilize Hip Joint is discussed by Arnold Sonnenschein[7] (Univ of München) on the basis of 71 resections on 63 females and 3 males aged 8-54 The preponderance of women is partly due to the greater incidence of arthrosis deformans among them The aim was to mobilize the hip joint after drug and physical therapy had failed to relieve the constant pain and to secure sufficient function in the affected hip

In evaluation of results freedom from pain mobility sta-

bility and duration of exercise without symptoms were considered Results were classified as excellent (Figs 164-167), good, fair and poor With excellent results, pain was absent during exercise extension and abduction in the hip joint was free and flexion was possible up to 90 degrees abduction to 40 degrees and rotation up to 20-40 degrees Good results meant recurrence of pain only after extensive physical exercise or on change in weather with disappearance on rest or



Fig 164 (left) Untreated congenital subluxation of hip.
Fig 165 (right) – Excellent result after femoral resection. Flexion 95 degrees; abduction 60 degrees; rotation, 45 degrees. Fatigue or pain set in after four hour walk. (Courtesy of Sonnenschein A Arch orthop. u. Unfall-Chir 47:1-44 1955)

with mild analgesics flexion limited to 45-60 degrees and abduction and rotation limited to 20-45 degrees each When results were fair pain appeared soon after exercise started with full extension of flexion contracture of 165 degrees, flexion was possible only up to 45-60 degrees and abduction and rotation up to 20-35 degrees With poor results hip pain was present even at bed rest and the patients depended on drugs Hip movements were very limited Of the 71 hips operated on excellent results were obtained in 14 good in 30 fair in 19 and poor in 8

It is realized that in no patient has resection achieved

complete mobility in every direction Thus resection of the proximal end of the femur like procedures using plastic material, is not an ideal operation Its success depends also on the condition of the soft tissues and musculature around the



Fig 166 (left) —Excellent result after femoral resection for subluxation of right hip. Subluxation of left hip is untreated.

Fig 167 (above) —Patient is able to squat without difficulty

(Courtesy of Sonnenschein, A.: Arch. orthop. u. Unfall-Chir 47:1-44 1955)

hip also increased mobility did not always mean reduction of pain However resection of the femoral head appears much simpler than procedures utilizing plastic prostheses and can be performed also in the presence of an unfavorable acetabulum.

Ischiofemoral Arthrodeses Study of Results R. Weber A. Coeuilliez and J Deramond[8] (Berck France) analyzed results in the first 50 of a series of 70 ischiofemoral arthrodeses performed by them since 1951 Forty three patients had coxalgia 4 osteoarthritis probably tuberculous 2 old osteomyelitis and 1 an inveterate congenital dislocation

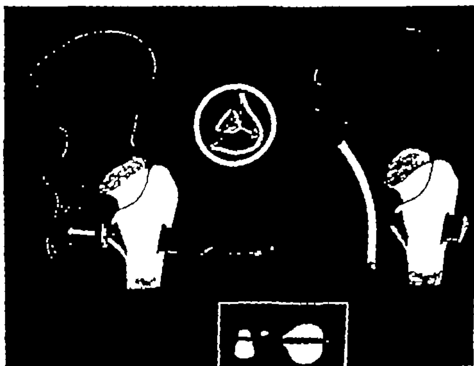


Fig 168.—Modification of Trumble operation. Top inset, taking of graft. Bottom inset, horizontal section (Courtesy of Weber R et al. Rev chir orthop 40 495-513 Oct Dec., 1954)

Ages ranged from 5 to 47 years and follow-up from six months to two years nine months Three methods were used ischiofemoral arthrodesis with osteotomy of the femur (Brittain Foley) on 17 patients ischiofemoral arthrodesis without osteotomy of the femur (Trumble) on 26 and a personal variant of the Trumble procedure in which the graft passes into the ischium through a tunnel in the femur (Fig 168) *on 7 The solidity obtained with the modified procedure* makes the use of screws unnecessary

(8) Rev chir orthop 40 495-513, Oct.-Dec 1954

The one operative death was due to unexplained cardiac failure at the close of operation in a patient who had received 300 Gm blood and whose treatment throughout the operation had apparently been correct He had been given hexanium but no connection could be established between the resulting hypotension and cardiac failure Blood must always be available for replacement because even with careful hemostasis sectioning of the tibia femur and ischium inevitably results in a substantial loss of blood A few patients in whom controlled hypotension was instituted did not need replacement transfusions in general however the patient s position during operation makes establishment of effective hypotension difficult There was no operative shock and the immediate postoperative sequelae were always excellent no patient had phlebitis or embolism

Consolidation was secured in 48 survivors although it was delayed in 5 by complications A girl 6 required reoperation because the graft failed to enter sufficiently into the ischium In the first of the patients with delayed consolidation a girl 12 the graft was poorly placed but there was extensive callus formation and one year after operation ankylosis could be seen in the x rays She is now leading a normal life. Post operative infection occurred in five patients two of whom had staphylococcic hip infections and two tuberculous disease. Fracture of the graft was seen in two patients each of whom had had an abscess some months before operation Arthrodesis was presumably performed while the tuberculous process was developing and the fractures were probably due to this Fractures of the donor tibia occurred preoperatively in one patient and in two others as a result of falls after walking had been resumed Some weakness of the tibia inevitably follows removal of an extensive graft

The authors never operate without having had the patient under observation for at least two months during which he is kept at bed rest, in plaster when necessary and is given antibiotic therapy Studies of the radiologic and clinical development and sedimentation rate are indispensable. Persons over age 13 can be operated on successfully before the tuberculous evolution has stopped completely but never during periods of activity The excellent consolidation ob-

tained in these patients shows that ischiofemoral arthrodesis is the best method of securing extra articular hip fusion.

Ischiofemoral Arthrodesis of Hip in Coxalgia. P Ingelrans, M Lacheretz J Nigoul and N Jouvenet[9] report results in 27 patients aged 4-32 years Nine of 18 males and 5 of 9 females were less than age 15 Specific antibiotic therapy and approximately six months of immobilization preceded surgery Two technics were utilized arthrodesis with osteotomy and arthrodesis without osteotomy The open method approach with a posterolateral incision was used



Fig 169 (left) —Ischiofemoral arthrodesis Consolidation of fracture and incorporation of graft

Fig 170 (right) —Graft increased in size. Primary fusion obtained on superior surface and at internal extremity of intraischiatic portion. Bony bridge laid down along inferior surface Arthrodesis clinically solid and considered successful despite lack of fusion of inferior internal extremity of graft to ischium.

(Courtesy of Ingelrans P et al Rev chir orthop 41 214-224 Apr June, 1955)

Ischiofemoral arthrodesis was indicated in the children because of difficulty of obtaining a satisfactory iliofemoral arthrodesis due to the cartilaginous state of the trochanter In some patients over age 15 ischiofemoral arthrodesis was indicated because of osteitis of the ilium

There were 24 successful results and 3 failures The patient s age did not seem to be a determining factor Satisfactory results were obtained in the same conditions whether

(9) Rev chir orthop. 41 214-224 Apr June, 1955.

adults or children were affected The percentage of complications and of delayed consolidation was the same regardless of the patient's age

To study the evolution of the graft successful results were considered on the basis of whether or not osteotomy was done and the character of the graft In eight cases the graft fractured and in six an ischiatic focus of osteolysis was produced All fractures healed with consolidation of the graft (Fig 169) or with hypertrophic callus The foci of ischiatic osteolysis were seen in the third or fourth month in cases in which consolidation was slow Figure 170 illustrates such a case Though radiologic fusion was incomplete at one point ankylosis was clinically almost perfect If a large short graft is used it may be placed in either an oblique or a transverse direction without increasing the likelihood of fracture

Osteotomy appears to be a primary factor in the success of ischiofemoral arthrodesis in shortening the free part of the graft and permitting development of an interfemoral ischiatic callus with the graft as a prop The procedure seems to be of great value in tuberculosis of the hip

True Lipoma of Meniscus is reported in two cases by G Stedtfeld[1] (Münster) A true lipoma of the joint is rare Simple hyperplasia of the adipose tissue of the joint capsule is not true lipoma Only lipoma with origin from the meniscus should be called true lipoma of the knee joint

CASE 1—Girl 9 had pain in the right knee. On flexion, a prominence was noted laterally There was no inhibition of motion, and x ray findings were negative. At operation a tumor histologically proved to be a lipoma, was removed from the lateral meniscus. After four years a recurrence was noted, and the entire lateral meniscus with the lipoma was removed. Recurrence is characteristic of lipoma.

CASE 2—Man, 25 had a lesion of the left medial meniscus treated conservatively four times between 1949 and 1953 A year later he reported that the meniscus repeatedly jumped out of joint and that he reduced it himself. There was no inhibition of motion. X rays revealed narrowing of the medial joint space and calcification in the cruciate ligaments. At operation, several loose bodies were found free in the joint, and lesions were present on the posterior and anterior parts of the meniscus. Removal of the entire medial meniscus disclosed an adipose tumor connected to it (Fig 171) Histologic examination showed several areas of adipose tissue separated from one another by

(1) Arch. orthop. u. Unfall-Chir 47:399-404 1955



Fig 171 (top) —Lipoma connected with medial meniscus. *M* meniscus *A B* course f histologic cut; *L* lipoma 1 1 4

Fig 172 (bottom) —Paraffin section of site f connection between meniscus and lipoma. *U*, connection; *F* f tty lobules *M* meniscus for course f cut, see *A B* Figure 171 Hematoxylin-eosin 1 6.

(Courtesy of Stedtfeld, G. Arch. orthop u. Unfall-Chir 47 399-404 1955)

collagen. At the point of connection the tissue was irregularly deposited in the collagen tissue. The entire tumor was surrounded on the surface by a thin mesothelium (Fig 172)

Histologic examination is necessary for diagnosis Treatment should be total extirpation of the meniscus to prevent recurrence

Patellar Prosthesis for knees with a defective patella and other mechanical defects has been used successfully by Dun

can C McKeever[2] (Houston) in over 40 cases The Vitallium prosthesis made in three sizes was designed so that the osseous portion of the patella could be fitted into it (Fig 173) A screw transfixing the patella and both lips of the prosthesis holds it in place when the quadriceps is relaxed When the quadriceps is under tension the screw is probably nonfunctional A jig is used to facilitate fitting the patella to the prosthesis

TECHNIC.—A median parapatellar incision is carried directly into the joint. The skin is reflected laterally to expose the anterior surface of the tendon overlying the patella, which can then be turned over completely exposing its articular surface. Necessary debridement or reconstruction on the remaining portion of the joint is carried out. In

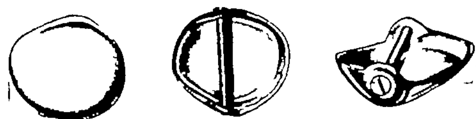


Fig 173 —Vitallium prosthesis. (Courtesy of McKeever D C. J Bone & Joint Surg 37 A 1074-1084 October 1955)

all cases, the patella should be trimmed to fit the prosthesis. The distal and medial portion should be preserved superior and lateral portions are removed. The jig is applied with points on the plate side, sticking into the articular surface of the patella and the ring on anterior surface of the patella. If the points will not engage, a preliminary cut may be made to convert the articular surface to a flat plane. In alinement of the jig the axis of the two most prominent parts of the ring edge, which will be in line with the vertical ridge on the prosthesis, should be in the axis of the intercondylar groove The jig is removed turned over and reapplied in the same axis of the intercondylar groove, and closed tightly A drill (7/64 in.) is passed through the drill guide and patella, and the chuck is removed, leaving the drill in place. The patella protruding through the ring is cut off flush with the ring The remnant should just fill the prosthesis The prosthesis is placed on the reshaped portion of the patella so that the small facet is toward the edge of the incision. The prosthesis is clamped tightly on the patella, and screw is then inserted tightly so that the tip engages the threaded screw hole in the prosthesis. If the prosthesis is

(2) J Bone & Joint Surg 37 A 1074-1084 October 1955

properly applied, it will turn over into a functional position so that the smaller facet faces the medial condyle and the larger facet faces the lateral condyle Special care should be taken that there is no ridge at the proximal edge of the intercondylar groove Postoperative effusion can be minimized by an opening from the suprapatellar pouch into the space beneath the quadriceps muscle A cotton and elastic pressure bandage is removed after 48 hours and motion is started at once. Weight bearing is started as soon as the extended leg can be raised. When only the patella is damaged 90 degrees of motion should be obtainable within three weeks Postoperative effusion, if any should be removed by tapping Hyaluronidase may be used to assist absorption. Hydrocortisone may be used intra-articularly if desired.

Popliteal Cysts Associated with Undiagnosed Posterior Lesions of Medial Meniscus Popliteal cysts also known as Baker's cysts popliteal bursitis semimembranous bursitis and posterior synovial herniations frequently communicate with the joint through a posterior capsular defect Harold M Childress[3] (Jamestown N Y) found such an outlet in 17 of 21 cysts treated surgically

Popliteal cyst is often associated with an intra articular pathologic condition any condition which increases joint fluid may cause such a cyst When excessive synovial fluid is developed within the joint some of it is forced through the posterior capsular opening into the semimembranous bursa. The popliteal swelling may persist even though the original lesion in the joint has subsided or has been corrected surgically The action is now reversed and the bursa produces fluid which is intermittently discharged into the joint, irritating the synovial lining and producing an effusion

If x rays are negative and there is neither a history nor physical signs of a joint lesion one concludes that the cyst is primary and that it should be surgically removed That optimism concerning surgical results is unwarranted is concluded from a study of 21 consecutive excisions of cysts There have been no recurrences yet results were unsatisfactory in three patients These patients had previously undiagnosed posterior lacerations of the medial meniscus as proved by subsequent arthrotomies Each recovered completely after meniscectomy The meniscal lesions cannot be detected by x rays or by air injections into the joint and in the presence of a cyst the clinical signs are obscured A

(3) J Bone & Joint Surg 36-A:1233-1237 December 1954

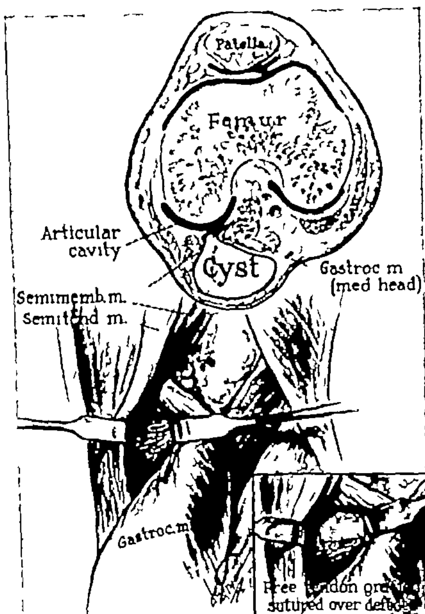


Fig 174 —Communication of cyst with joint and closing of opening by means of tendon sheath. (Courtesy of Childress, H M. J Bone & Joint Surg 36-A 1233-1237 December 1954)

lesion of the posterior portion of the medial meniscus should be suspected even though it is not evident in the x rays when the cyst has or has had, an associated joint effusion of unknown origin Early diagnosis and surgical treatment of the meniscal lesion will prevent the formation of such cysts.

TECHNIC.—With the patient lying prone and the knee flexed about 25 degrees, a curved longitudinal incision is made convex medially Usually the base of the cyst covers an area of the posterior joint capsule 1 in. or more in diameter If a communication exists, it is nearly always under the tendinous insertion of the medial head of the gastrocnemius muscle (Fig 174) Air or methylene blue may be used to identify the opening If the aperture is small its edges may be plicated or approximated snugly If the opening is large a free tendon graft is used (Fig 174)

Static Deformities of Knee in Cuba are said by Justo Pausa Trujillo[4] to be due in most cases to rickets despite the Cuban sunshine They are more frequent in white persons than in

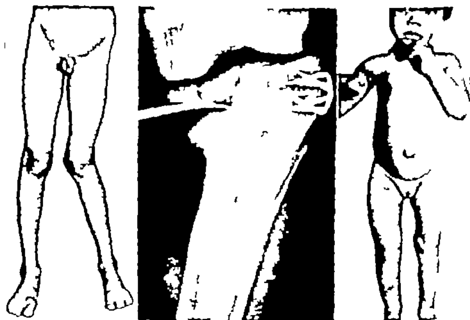


Fig 175 (left) —Left genu valgum.
Fig 176 (center) —Raising of internal tibial tuberosity with curved osteotomy and epiphysiodesis with blunt chips on opposite side. Effacement of osteotomy performed six years earlier can be seen
Fig 177 (right) —Results with osteotomy and epiphysiodesis in child with rachitic deformity
(Courtesy of Trujillo, J P Ci ortop y traumatol. Habana 19,3-29 Jan. Mar 1955)

(4) Ci ortop y traumatol Habana 19 3-29 Jan. Mar 1955

Negroes The 780 cases of deformities of the lower limbs seen at Hospital Municipal de Infancia Havana during 1935-54 were distributed as follows genu varum 291 genu valgum 283 tibia vara 143 genu valgum with pes planus 36 genu recurvatum 8 and a few with various associated conditions Tibia vara was common in small children genu varum in those a few months old and genu valgum in those who were starting to walk Figure 175 shows one of the older patients who had a typical left genu valgum which was corrected by appropriate treatment. Many varus deformities were found in children who were completely normal in appearance without any clinical, radiologic or hematologic rachitic stigmas these children can be regarded as normal Treatment was generally effective but the younger the patient was when it began the sooner he was cured. Simple methods such as vitamin therapy corrective exercises and orthopedic shoes were tried first metallic prostheses and plaster casts were used in more advanced cases Surgical procedures were used only when the deformity was pronounced Osteotomy with epiphysiodesis on the opposite side can sometimes be used successfully (Fig 176) Figure 177 shows results obtained by this procedure in a child with a severe rachitic deformity of the lower third of both legs

Anterior Tibial Syndrome Following Arterial Embolism is reported by D C. Watson[5] (Liverpool Royal Infirm) in two women over age 50 The syndrome is characterized by pain swelling redness and tenderness in the front of the leg There is inability to dorsiflex the foot and toes The peroneal muscles are not affected Involvement of the anterior tibial nerve produces paralysis of the extensor digitorum brevis muscle and sensory loss on the dorsum of the foot The degree of residual footdrop is lessened by development of contracture in the affected muscles In previous reports this syndrome has usually followed strenuous unaccustomed exercise involving use of the leg muscles

Woman 70 hypertensive with auricular fibrillation, had severe pain in the left calf beginning seven hours before hospitalization The left lower limb was cold and pale from the knee downward, and the popliteal and ankle pulses were absent. Femoral pulsation was normal She was unable to dorsiflex the foot and toes. The peroneal

(5) Brit. M. J 1:1412 1414 June, 11, 1955.

and posterior tibial muscles showed slight weakness. The left ankle jerk was reduced and all forms of sensation were diminished below the left knee. Treatment included paravertebral lumbar sympathetic block.

Three days later the patient complained of pain in the front of the left leg The skin over the anterior tibial compartment was red, swollen and tender The swelling subsided in about six weeks, and the anterior tibial muscles then felt woody The peroneal and posterior tibial muscles regained normal power but there was no recovery of dorsiflexion of the foot and toes Sensation to light touch and pin prick returned. About two months after admission the patient was able to walk, but the foot drop required a toe-raising spring

The two cases suggest that the anterior tibial syndrome has its origin in vascular inadequacy Profound arterial spasm is a well recognized concomitant of embolic arterial occlusion *The appearance of the syndrome after an interval* of two to three days in both patients may have been due to delayed improvement in the blood supply to the leg muscles This would cause swelling of the muscles and in the anterior tibial compartment increased tension might well lead to further interference with blood supply

This syndrome should be differentiated from cellulitis of the leg osteomyelitis of the tibia tenosynovitis acute thrombophlebitis and traction lesions of the lateral popliteal nerve

Experiences in Operative Treatment of Flatfoot Critical Discussion of Indications. K Niederecker[6] (Wurzburg) on the basis of 25 years experience in operative treatment of flatfoot reports about 400 cases with 582 operations done in the last eight years Operations on 100 patients were performed more than three years previously making assessment of results possible

The type of operation depends on the type of deformity in general five groups can be differentiated (1) Loose bending flatfoot with weakness of ligaments in children and adolescents is successfully treated by tendon transplant In 36 of 44 cases postoperative results were considered very good. (2) Muscle contracture bending flatfoot without bone deformity is treated by operation after failure of conservative management. Arthrodesis is not performed but, as in the first group tendon transplant yields very good results (3) Congenital

(6) Arch. orthop u Unfall-Chir 47 522-544 1955

bending flatfoot with bone deformity (Figs 178-180) in children, adolescents and adults is treated by osteotomy of the neck of the talus Even with careful technic talonavicular arthritis is prone to develop making it obligatory to have strong indications for surgery Besides osteotomy tendon transplant is performed Good results were obtained in 10 of



Fig. 178.—Congenital extremely rolling foot (group 3) in girl operated on at age 4 Inset, preoperatively, below 5½ years postoperatively (Courtesy of Niederecker K. Arch. orthop. u. Unfall-Chir 47:522 544, 1955)

21 cases (4) Bending flatfoot with talonavicular contracture associated with severe deformity and contractures of several muscles is managed by talonavicular arthrodesis or osteotomy and treatment of the muscular contractures but results are not good In 54 cases only 17 very good and 5 good results were obtained. (5) Severe deformities with congenital malformations are treated by osteotomy of the neck of the talus resection of the joint and osteotomy of the cuneiform metatarsal joints Mobility is not anticipated after this procedure and the foot is immobilized for six weeks. Among 20 cases

good results were obtained in 18 Only in the last two groups of graver deformities is arthrodesis necessary Usually motility of the talonavicular joint can be preserved Besides these five groups of cases there are several types of acquired deformities (postpolio traumatic or arthritic)

In a new method of attempted objective assessment of function an electric light attached to the foot projects a beam



Fig 179 (left) —Plaster of paris model f left foot of girl befor she was operated on at age 4
Fig 180 (right) —Left foot 5½ years postoperatively
(Courtesy of Niederecker K. Arch. orthop. u Unfall-Chir 47 522 544 1955)

of light on a scale to determine the degree of flexion and abduction Rotation is determined by means of a spirit level

The operations should not be performed before age 6 because of the inability of young patients to exercise actively and because of lack of satisfactory muscular co-ordination Postoperative treatment by casts dressings special shoes and exercises is important for good results

Further Experience with Extra articular Arthrodesis of Subtalar Joint is presented by David S Grice[7] (Children s Hosp Boston) Surgery for correction of paralytic flatfoot has several major objectives The calcaneus must be replaced beneath the talus and must be maintained in normal relation to it. The talus must be brought out of equinus deformity Muscle balance should be restored by muscle transplantation to avoid recurrence The deforming everting power of the peroneal muscles should be removed and active inversion and dorsiflexion restored to the talonavicular area In a child operation should not interfere with the growth of the foot.

Failures in surgical management of paralytic flatfoot have

(7) J Bone & Joint Surg 37 A 246-259 April, 1955.

been due to inadequate replacement of the calcaneus beneath the talus, neglect of correcting equinus deformity inadequate correction of muscle imbalance and overcorrection of the deformity resulting in talipes varus

Extra articular fusion of the subtalar joint with bone grafts placed in the sinus tarsi (Fig 181) can be performed quite easily and can provide adequate correction of paralytic

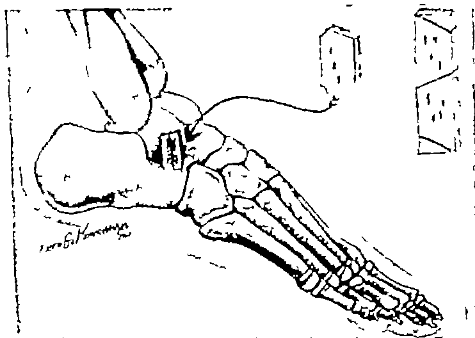


Fig. 181 —Placement of grafts in sinus tarsi at right angles to axis of motion through the subtalar joint. (Courtesy of Grice, D S : J Bone & Joint Surg 37-A 246-259 April, 1955.)

flatfoot To prevent recurrence in severely deformed feet it is necessary to correct the equinus deformity and to restore support to the talonavicular area. This procedure is well adapted to use in the young child in whom the deformity is progressing rapidly The procedure can also be used as an alternate to triple arthrodesis to correct valgus deformities in older patients In feet of adult architecture with severe deformity it probably is impossible to restore the calcaneus to normal position beneath the talus without resecting the subtalar joint. Therefore triple arthrodesis is necessary In the patients in Grice s series solid fusion was obtained in all

in whom autogenous bone had been used The height of the foot was restored and growth maintained.

In three patients severe equinus deformity was present preoperatively and could not be corrected at the time of extra articular fusion of the subtalar joint The fusion remained solid but the talocalcaneal bone mass became dis-



Fig 182.—Boy 10 who had poliomyelitis at age 2. Casts and braces did not correct equinus deformity At age 6, deformity was corrected by a wedging cast. Deltoid ligament was tightened and peronaeus brevi transplanted beneath talus and inserted into th navicular Correction was mai tained (Courtesy of Grice, D S.; J Bone & Joint Surg 37 A 246-259 April, 1955)

placed into valgus deformity within the ankle mortise In one after the deformity had recurred the heel cord was stretched by means of a series of wedging casts until the equinus deformity of the talus was corrected The peronaeus brevis was then transplanted beneath the talonavicular joint and inserted into the navicular The deltoid ligament was tightened and the deformity was corrected Correction was maintained after the secondary procedure (Fig 182)

Fusion of the subtalar joint with autogenous bone grafts in the sinus tarsi is primarily extra articular arthrodesis

which does not interfere with the growth of the foot If this procedure is done in combination with tendon transplantation to equalize muscle strength satisfactory correction of the deformity can be obtained

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AMPUTATIONS AND PROSTHESES

Prostheses for the Juvenile Amputee. George T Aitkin and Charles H Frantz[8] (Grand Rapids Mich) state that children as young as 12 months can stand on an artificial limb and quickly learn to walk The functioning of the amputation stump in a prosthesis aids in stimulating growth of the skeleton and soft parts People who walk best on artificial limbs are those who were fitted at an early age. The upper extremity prosthesis must await development of a maturity level sufficient to tolerate and mobilize it. This is achieved at the level of intellectual and motor development of about 4 years An artificial arm applied at this age will allow a full year of training and acquaintance and mastery of an acceptable degree of skill before the child enters kindergarten

Although the recommendation for a lower extremity prosthesis is readily acceptable to parents they often reject an upper extremity prosthesis This phenomenon usually pertains to girls with the reluctance exhibited by the mother

It is fallacious to expect the young amputee to wear an upper extremity prosthesis all of his waking hours The goal is functional skill and appreciation of the prosthesis in offering the skill. The advantages of the appliance will be manifested in chores schoolroom activities social functions and certain recreational activities The danger of a wooden forearm and metallic hook is evidenced in body-contact sports The prosthesis need not be worn during such activities

The appreciation of the child s stage of motor skill and emotional development should aid in forming a common sense outlook toward the use of an upper extremity appliance

(8) A.M.A. J Dis. Child. 89 137 143 February 1955

The young amputee properly guided, will show progressive development in skilful use of the artificial limb which in varying degrees tends to parallel his normal prehensile maturation pattern

End Results in Suction Socket Prosthesis for Above-Knee Amputees are reported by Augustus Thorndike[9] (Boston) in 2 184 patients attending 30 Veterans Administration clinics. Almost 85% of the amputees have used this type of prosthesis for seven years

Analysis of the 15 7% (343) failures showed that the greatest number occurred in early stages of the program and that, as the surgeon and prosthetist gained in experience and judgment the percentage of failures generally decreased. Usually after formal training of surgeons and prosthetists perseverance in overcoming inevitable initial difficulties leads to attainment of skill wisdom and confidence which lead to wiser selection better and more rapid initial fitting fewer revisions and less strain on patient motivation

The amputee must have a well muscled and contoured stump Firm muscles and a minimum of fat simplify obtaining a good fit and decrease the number of adjustments needed to maintain an accurately fitting socket. Strong muscles are needed to control hip action Actively contracted muscles increase circumference of the stump causing tight contact with the wall of the socket assisting the stump to carry the prosthesis and reducing negative pressure generated during the swing phase. The amputee must live near the limb shop for multiple check ups and socket adjustments during the first six months trial of the socket He must be employed where he can obtain leave to visit the shop and clinic frequently and he must be motivated to devote the time necessary for gait training with the new prosthesis

He should maintain body weight while undergoing adjustments and training Gain in weight multiplies the problems of fit and alinement and loss in weight causes shrinkage of the stump and the frequent complaint of loss of suction often uncorrectible to the patient s needs

Skin diseases the result of friction or sebaceous glands causing cystic degeneration and furunculosis and certain

(9) Am. J Surg 89 919 923 April, 1955

allergic reactions, are often aggravated or caused by poor fit and alinement or by improper finish of the socket wall

Incidence of failure may be reduced to 5.9% which has been reported in the Veterans Administration's six most successful clinics

Syme's Amputation J H Shelswell[1] (Royal Nat'l Orthopaedic Hosp London) reviewed 305 Syme's amputations performed on 302 patients. Twenty-eight were immediate failures in that reamputation was necessary within less than a year Later the amputation became unsatisfactory in 45 more patients Commonest cause of failure was a vascular syndrome characterized by coldness blueness congestion and eventual ulceration or gangrene. Vascular insufficiency caused failure in 22 instances and came on with remarkable regularity about 20 years after amputation Probably the interference with the anastomosis around the ankle joint at the time of amputation permanently diminishes the blood supply to the lower part of the stump Second commonest cause of failure was sepsis occurring in 19 patients Such minor complications as aching pain in the stump callosity formation chilblains and edema, caused enough symptoms to make above knee prosthesis necessary in 31 patients Syme's amputation caused no difficulties in 201 patients

It is concluded that the Syme's amputee can do anything that the below knee amputee is capable of doing and has certain benefits the latter does not have.

[In selected cases there is no other amputation which so nearly approximates normal function and endurance. Failures of the Syme's amputation are the result of poor selection (marked arteriosclerosis or extensive scarring of the heel cap) or faulty surgical technic, with resultant injury to the arterial blood supply to the heel cap —Ed.]

Transmetatarsal Amputation in Peripheral Vascular Disease. Herbert E. Pedersen and A Jackson Day[2] (Detroit) believe that, in properly selected patients with peripheral vascular disease transmetatarsal amputation results in an excellent functioning extremity with relief from symptoms and that it often prevents a more disabling amputation at a higher level With gangrene limited to toes removal of all the toes is indicated both as treatment for the presenting disease and as a prophylactic measure

(1) Lancet 2 1294-1299 Dec. 25 1954
(2) J Bone & Joint Surg 36-A 1190-1199 December 1954

If the skin on the dorsum of the foot is warm and has good nutrition success can be expected. Many patients fall into a borderline category and must be advised that the possibilities of healing are questionable. The preoperative period of preparation is considered the most important factor in determining success During that period of two to three weeks, the patient is restricted to bed rest with the extremity flat in bed and the head of the bed elevated a few inches It is hoped that rest will decrease the circulatory requirement prevent additional trauma allow control of infection and prevent extension of gangrene

Presence of infection should be assumed in all patients including those classified as having dry gangrene or ischemic necrosis All patients are given antibiotics and loose sterile dressings are worn at all times The dressings are removed once or twice daily for a 15 minute foot bath in tepid water to which some white soap has been added The foot baths promote drainage and allow a gentle debridement. Only when infection has been completely controlled and there is no progression of gangrene can transmetatarsal amputation be considered

The amputation level is just proximal to the metatarsal heads As atraumatic a technic as possible is mandatory After operation the patient returns to strict bed rest At least half the sutures should remain in place for two weeks Buerger s exercises are begun 10-14 days after operation in preparation for ambulation at 3 weeks by that time healing is usually complete if it took place by primary intention

With the technic described 23 amputations were done on 21 patients with peripheral vascular disease—3 for thromboangiitis obliterans 5 for arteriosclerosis and 15 for diabetes with arteriosclerosis Primary healing followed eight operations small granulating areas- uch are expect 1 are present after four sec ling followe two resulted in gross failu commones delayed healing are marg of the and wound infection. W shoul in the same fashion in s prepa gery surgical removal of dary cl skin should be avo

While it is true that the poorer the circulation the less chance there is of healing success or failure cannot be determined on the basis of palpable pulsation It is probably determined by the extent of collateral circulation development. None of the objective methods for determining this factor are as successful as inspection of the leg for the color and nutrition of the skin and subcutaneous tissues palpation for warmth and clinical experience.

Although little work has been done on the problem there is some experimental and much clinical evidence that transmetatarsal amputation takes great advantage of the collateral circulation as it develops in the leg

Criteria for and Results of Transmetatarsal Amputation for Ischemic Gangrene Henry Haimovici[1] (Montefiore Hosp New York) on the basis of experience with 59 cases discusses criteria for transmetatarsal amputation in patients with gangrene ulceration and infection of the toes associated with obliterative arterial disease The main indication is gangrene of one or more toes A sharp line demarcating the lesions is a favorable sign for a successful outcome In chronic ulceration of the toes or ball of the foot in patients with occlusive arterial disease associated with diabetic neuropathy and occasionally with metatarsal osteomyelitis transmetatarsal amputation through skin with normal sensation is of value. Local infection and the condition of areas adjacent to the lesions are of major importance in determining the advisability of amputation Although the presence of a popliteal or pedal pulse appears to insure prompter healing of the amputation wound, absence of these pulses is no contraindication to surgery at this level. In contrast, the degree of collateral circulation available in the forefoot appears to be the decisive criterion Local pain is not a contraindication However radiating pain toward the ankle or leg often unrelieved by narcotics indicates a poor prognosis

Adequate antibiotics and preoperative asepsis of the skin (washing once or twice daily for about a week) greatly enhance the possibility of a successful outcome with this operation The lines of skin incision are shown in Figure 183 No forceps are used in handling the flaps Atraumatic handling

(1) A.M.A. Arch. Surg. 70:45-51 January 1955

Diagnosis of Orthopedic Lesions by Aspiration Biopsy Results of 1 061 Punctures Carlos E. Ottolenghi[4] (Buenos Aires) states that aspiration biopsy is simple and carries no risk to the patient Aspiration can be done at various points thus increasing the chances for a correct diagnosis Deep

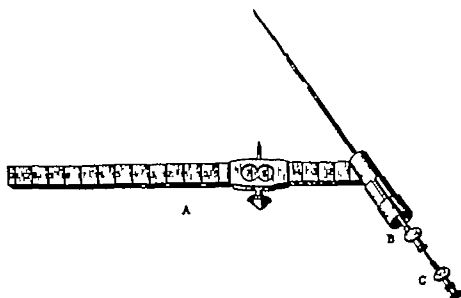


Fig 184—Instruments assembled *A* author's needle guide; *B* aspiration needle, 12 cm. long with 2 mm. gauge and markings from 6th to 10th cm., and *C* exploring needle, 18 cm. long with 1 mm. gauge. (Courtesy of Ottolenghi, C. E. J Bone & Joint Surg. 37-A 443-464 June, 1955)

areas can be reached which otherwise would require major surgical intervention Usually the patient need not be hospitalized. Aspiration biopsy does not exclude open biopsy nor is it disadvantageous to later surgical or x ray treatment. However it should be done before any kind of treatment is started

A special set of instruments was developed for aspiration of the spine (Fig 184) The correct position of the needle is at an angle of 35 degrees this corresponds to the angle of the

(4) J Bone & Joint Surg. 37 A:443-464 June, 1955

guide (Fig 185) Because of anatomic difficulties which it has not been possible to overcome aspiration biopsy of the vertebral bodies between the 1st and 10th thoracic vertebrae cannot be carried out with this technic.

Of 1 061 aspirations 895 (84.3%) gave positive results 45

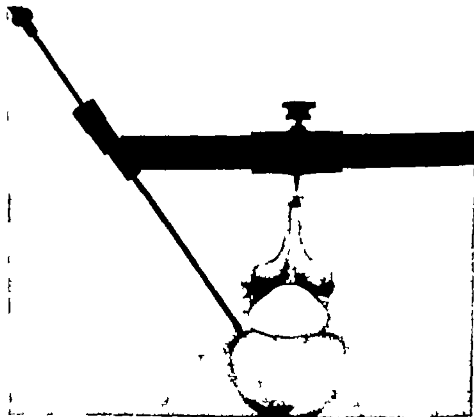


Fig 185—Guide in place with needle reaching vertebral body (Courtesy of Ottolenghi, C. E. J Bone & Joint Surg 37 A 443-464 June, 1955)

(4.25%) doubtful and 121 (11 4%) negative. Punctures were made in nearly all bones of the skeleton except those at the base of the skull and the vertebrae between the 1st and the 10th thoracic levels Of the 895 positive results 871 were confirmed by open biopsy surgical exposure of the lesion or the clinical course The greatest number of diagnoses were for malignant tumors

The benefit derived from aspiration biopsy is well shown in the case of a girl 15 who had been treated for tuberculosis



Fig 186.—Ewing's sarcoma of sacroiliac joint (Courtesy of Ottolenghi, C. E. J Bone & Joint Surg. 37 A:443-464 June 1955)

of the sacroiliac joint Aspiration biopsy showed the lesion to be a Ewing sarcoma (Fig 186)

[For lesions in bones easily accessible, open biopsy is to be preferred. Adequate abnormal tissue to provide a comprehensive microscopic section can always be obtained if the surgeon is competent. Very often the diagnosis can be established by the gross appearance and a frozen section. In many cases, definitive treatment can be carried out at the time of taking the biopsy specimen by excision of the lesion or as in one case, which proved to be a metastatic carcinoma of the femur with pathologic fracture, insertion of an intramedullary rod to stabilize the bone fragments. For lesions of the vertebrae, ischium and other areas not readily accessible for open operation needle biopsy is a most helpful procedure and should be used by all qualified surgeons The editor has had the good fortune to see the skill with which Ottolenghi is able to obtain diagnostic material by needle biopsy of a lesion of a vertebral body.—Ed.]

Transplantation of Posterior Tibial Tendon. Melvin B Watkins James B Jones Charles T Ryder Jr and Thomas H Brown Jr[5] (New York Orthopaedic Hosp) report on 29 transplantations of the posterior tibial muscle and tendon through the interosseous space to the dorsum of the foot done on 26 patients since September 1951 Posterior tibial transplantation cannot be expected to produce positive cor-

(5) J Bone & Joint Surg 36-A 1181 1189 December 1954

rection of a fixed deformity any more than can other tendon transfers Therefore any structural equinus varus or other deformity should be dealt with before transplantation so that the foot can be placed in neutral position with at least 90 degrees of dorsiflexion Postoperative rehabilitation is simplified when the patient has already learned to contract the posterior tibial muscle independently and voluntarily When possible he should be educated to do so preoperatively

TECHNIC.—The procedure is carried out through three incisions. The first one is on the medial border of the foot along the course of the posterior tibial tendon, from just below the medial malleolus to

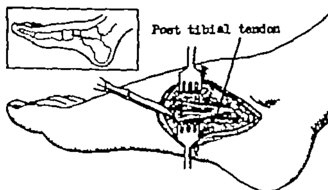


FIG. 187 —First incision. (Courtesy of Watkins, M B., *et al.* J Bone & Joint Surg 36-A 1181 1189 December 1954)

the medial cuneiform (Fig 187) The tendon is freed from its sheath and incised distal to its primary insertion into the tuberosity of the navicular As much length of tendon as possible must be obtained.

The second incision is made parallel and lateral to the lower third of the crest of the tibia (Fig 188) The deep fascia is opened and the anterior tibial muscle retracted laterally exposing the interosseous membrane The membrane is incised through sufficient length to allow the belly of the posterior tibial muscle to fill the interosseous space. This important step actually converts the posterior tibial muscle from a posterior to an anterior position Pressure from behind causes the muscle to bulge into the space and the tendinous portion to become visible distally A blunt instrument is passed about the muscle and its tendon pulled out. Gentle traction on the distal end of the tendon brings more of the muscle belly into the anterior compartment of the leg Injury to the posterior tibial vessels and nerve is avoided by keeping the instrument close to the muscle in pulling it through the interosseous space.

The third incision is made on the dorsum of the foot over the desired site of the new insertion. The posterior tibial muscle is passed beneath the anterior tibial tendon and through a subcutaneous tunnel to the dorsum of the foot (Fig 189) The length of tendon available may alter the plan of location and method of insertion. In general the location should depend on the degree of imbalance and power of the remaining musculature

The most favorable results with this procedure may be expected in the varus foot with an overactive posterior mus-

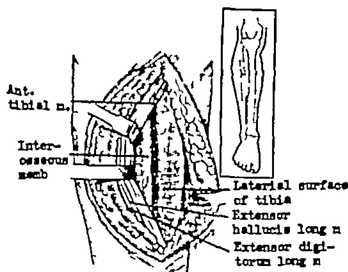


Fig. 188.—Second incision. (Courtesy of Watkins, M B., et al. J Bone & Joint Surg 36-A:1181 1189 December 1954)

cle, good calf muscles and a deficit in power of the muscles of dorsiflexion Cerebral spastic paralysis and anterior poliomyelitis were the commonest conditions for which the operation was performed The others were congenital clubfoot spina bifida an atypical form of muscular dystrophy Charcot Marie Tooth disease peroneal paralysis secondary to trauma and Friedreich s ataxia. Each patient had postoperative immobilization which maintained maximal ankle dorsiflexion

Of 25 patients eligible for final evaluation 17 had excellent, 7 good and 1 fair results

Transplantation of the posterior tibial muscle and tendon through the interosseous space is a valuable procedure and

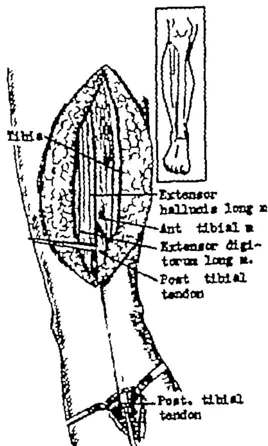


Fig. 189.—Posterior tibial tendon passed to dorsum of foot. (Courtesy of Watkins, M. B. *et al.* J Bone & Joint Surg 36-A 1181 1189 December 1954)

can be relied on to restore active dorsiflexion of the foot. The operation is applicable to a wide variety of conditions in which the posterior tibial muscle has good power and there is a need for an additional dorsiflexor of the foot

Complete Muscle Transposition is reported by E. R. Schottstaedt Loren J Larsen and Frederic C Bost[6] (San Francisco) The procedure is used in reinforcing or replacing muscle function lost by paralysis absence of muscles or congenital abnormalities To reinforce or replace elbow flexion the chondrosternal two thirds of the pectoralis major is transposed to extend from the coracoid process of the scapula to the radial tubercle (Fig 190) After this operation a boy,

(6) J Bone & Joint Surg 37 A 897 919 October 1955

aged 6 with bilateral congenital absence of elbow flexors could lift both hands to the mouth and could flex either elbow to 90 degrees (Fig 191) Elbow flexion can also be replaced or reinforced by transposing the latissimus dorsi to extend from the coracoid process of the scapula to the radial tubercle To reinforce or replace elbow extension the latissimus dorsi may be transposed to extend from the acromion to the olecranon (Fig 192) as demonstrated in a girl aged 5,

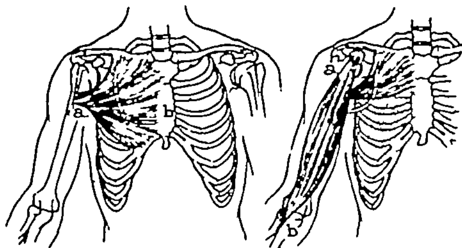


Fig. 190.—Muscle transposition to reinforce or replace elbow flexion *a* Insertion, *b* origin. (Courtesy of Schottstaedt E. R., *et al.* J Bone & Joint Surg. 37-A.897 919 October 1955)

with paralytic poliomyelitis with triceps function completely lost.

Other successful muscle transpositions performed by the authors include (1) transplantation of the sternocleidomastoid origin to the acromion to reinforce scapular rotation (2) transposition of the pectoralis major to extend from the mastoid process to the third and fourth ribs to reinforce neck flexion and head balance in a patient with bilateral paralysis of sternocleidomastoid and scaleni muscles and (3) transposition of the sternocleidomastoid to extend from the malar to the mandible to replace the masseters and improve mastication In an operation performed too recently for evaluation, the sternocleidomastoid was transposed to extend from the fascia anterior to the ear and from the outer zygomatic arch to the lips to replace the orbicularis oris



Fig 191 —Left arm actively flexed to 90 degrees against gravity after transposition of pectoralis major (Courtesy of Schottstaedt, E. R. *et al* J Bone & Joint Surg. 37 A 897 919 October 1955)

Other possibilities for transposition include use of the latissimus dorsi as an extensor of the head and neck posterior transposition of the pectoralis major to make an efficient elbow extensor and transference of the gracilis and adductor

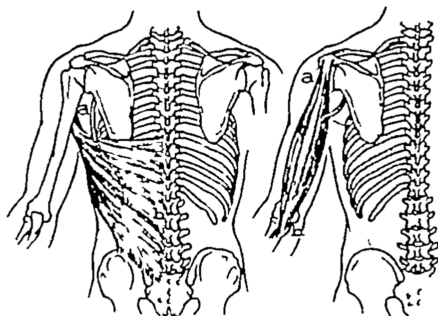


Fig. 192.—Muscle transposition to reinforce or replace elbow extension a insertion, b, origin. (Courtesy of Schottstaedt, E. R., et al.: J Bone & Joint Surg 37 A: 897-919 October 1955)

longus to replace a paralyzed rectus abdominis Before considering such transpositions one should be certain that the muscle to be transplanted does not represent the only remaining motor for a vital function which it is accomplishing in its original site

Transverse Anterior Approach to the Hip according to J Vernon Luck[7] (Los Angeles) has proved helpful in carrying out a wide range of operative procedures such as arthroplasty of the hip open reduction of fracture of the hip pinning or grafting of fracture of the neck of the femur replacement and fixation of slipped capital femoral epiphysis and insertion of an upper femoral prosthesis

The landmarks for this transverse approach are the anterior superior iliac spine, the greater trochanter and the sym

(7) J Bone & Joint Surg 37 A 534-536 June, 1955

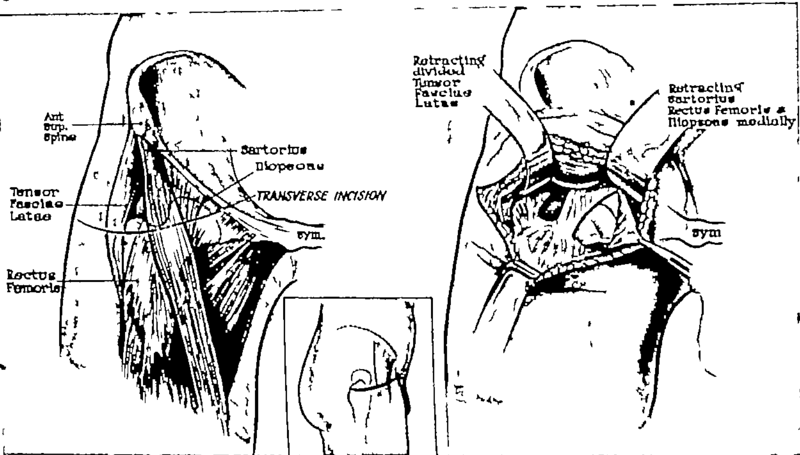


Fig 193 —Method of transverse anterior approach to hip. (Courtesy of Luck, J V : J Bone & Joint Surg 37 A:534-536, June 1955.)

physis pubis To locate the femoral head, the usual surface line is projected between the anterior superior iliac spine and the symphysis pubis The femoral head is below the midpoint in that line. The greater trochanter is subcutaneous

TECHNIC.—The patient is placed in supine position. The medial end of the transverse skin incision should lie over the femoral head It is begun just lateral to the midpoint between the anterior-superior iliac spine and the symphysis pubis directed lateralward in the skin lines in or near a flexor crease of the hip and ended at a point lateral to the femur in the region of the greater trochanter If the hip is placed in slight abduction and flexion the intertrochanteric area will lie beneath the incision Before the transverse sectioning of the ten sor fasciae latae when required subcutaneous fat and skin are dis sected from the fascia lata and the tensor muscle for 2.5 or 5 cm above and below the level of the skin incision The tensor fasciae latae is identified by sectioning the fascia lata laterally over or distal to the trochanteric area. The nerve enters the muscle posteriorly in its prox imal half and is not disturbed since transverse sectioning is carried out in the distal third of the muscle.

After the fascia lata and tensor fasciae latae have been retracted proximally and distally the sartorius rectus femoris and iliopsoas are retracted medially (Fig 193) The capsular attachments of the rectus femoris are dissected from the capsule to facilitate medial retraction. Whether or not its origin from the anterior inferior iliac spine is sectioned depends on the extent of exposure of the acetabulum required. When the tensor fasciae latae has been completely retracted it may be unnecessary to section the rectus femoris for an adequate view of the acetabulum.

Laterally the approach may include detachment of the gluteus medius and gluteus minimus with or without detachment of the greater trochanter If necessary transplantation of the greater trochanter distally can be carried out with ease Extension of the incision in the fascia lata upward between the posterior margin of the tensor fasciae latae and the anterior margin of the gluteus maximus frequently makes it unnecessary to divide the tensor fasciae latae transversely

When only the hip joint proper is to be opened and explored, as in biopsy the transverse incision need not be carried so far laterally The tensor fasciae latae may be retracted and need not be sectioned even in extensive operative procedures, if the tissues are relaxed and lend themselves to wide retraction.

Closure of the operative wound is facilitated by moderate flexion of the hip.

In Luck s experience the transverse anterior approach in properly selected cases has the advantages of being direct versatile, simple and relatively bloodless

Ischiofemoral Arthrodesis J Benassy and J O Ramadier[8] present results in 45 patients over age 15 followed for at least six months Twenty five had tuberculous coxalgia and 20 a variety of nontuberculous conditions such as old congenital or traumatic dislocations failure of arthrodeses of a different type and dystrophies Two procedures were used —Trumble s method in which the graft is merely wedged

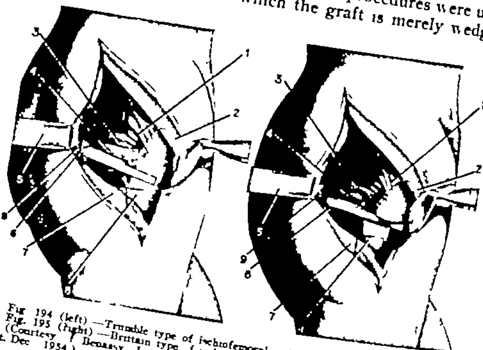


Fig 194 (left) —Trumble type of ischiofemoral arthrodesis. Fig. 195 (right) —Brittain type of ischiofemoral arthrodesis. (Courtesy J Benassy J and Ramadier J-O Rev chi orthop 40 481-494 Oct. Dec 1954)

between the femur and the ischium (Fig 194) and Brittain s ischiofemoral arthrodesis with osteotomy (Fig 195) Whichever procedure is used it seems best to take the tibial graft from the healthy side rather than the one that has been immobilized Prolonged immobilization often leads to trophic disturbances and the resulting bone fragility may permit fracture of the graft If the graft is taken at the beginning of the operation while the patient is still on his back, the procedure will be facilitated and the time during which he must be kept in ventral decubitus will be shortened A large graft is needed but care must be taken not to weaken the donor

(8) Rev chi orthop 40 481-494 Oct. Dec 1954

tibia. Proper placing of the limb and rigorous immobilization in a full plaster cast, including the thigh on the opposite side for three or four months, depending on the patient's age, are essential If x rays are satisfactory the full cast can then be replaced by a smaller one and walking begun

Careful choice of the time of operation insistence on six months previous immobilization in plaster, administration



Fig. 196.—Result of Brittain operation after about six months in case of old coxalgia with extensive destruction and faulty position. (Courtesy of Bénassy J., and Ramadier J-O: Rev chir orthop 40:481-494 Oct. Dec., 1954)

of 100-120 Gm streptomycin supplemented by isoniazid and radiographic evidence that the tuberculous process had been stabilized three months before operation led to success in 22 of the 25 patients with coxalgia The Brittain operation produced slightly better results (Fig 196) with only one failure in 16 cases, compared with two failures in 9 cases with the Trumble procedure. The 20 patients with nontuberculous conditions were generally much older than the others several being in their 50's and 60's As a rule operations of this type are not advisable in fatigued obese or cardiac patients

or those with venous disorders predisposing to phlebitis or embolism Most older patients however, had undergone surgical procedures that made intra articular arthrodesis im possible Even so there were 15 successes showing that ischiofemoral arthrodesis has a definite value in certain com plex cases

Arthrodesis of Hip in Wide Abduction is discussed by LeRoy C Abbott and Donald B Lucas[9] (Univ of Califor nia) Arthrodesis of the hip joint is often difficult to obtain, even under the most favorable conditions It usually is per

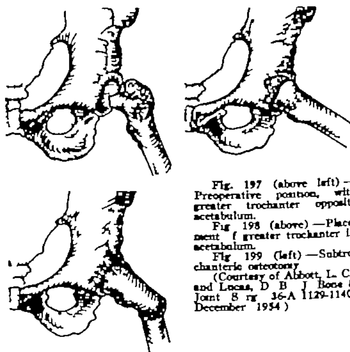


Fig. 197 (above left) —Preoperative position, with greater trochanter opposite acetabulum.
Fig 198 (above) —Placement of greater trochanter in acetabulum.
Fig 199 (left) —Subtrochanteric osteotomy
(Courtesy of Abbott, L. C., and Lucas, D B J Bone & Joint S rg 36-A 1129-1140 December 1954)

formed to halt disease process relieve pain or provide stabil ity in the joint. Indications are massive destruction of the hip joint following tuberculosis or pyogenic infection non union of the femoral neck with aseptic necrosis of the head in cup arthroplasty with sepsis in long standing irreducible dislocation of the hip and in Legg Calvé-Perthes disease, after failure of other methods

Frequent failure to obtain bony fusion in these patients led

(9) J Bone & Joint Surg 36-A 1129 1140 December 1954

to development of treatment which was called arthrodesis of the hip in wide abduction The method as originally described was done by (1) correcting the deformity, (2) arthrodesis of the hip in wide abduction and (3) reduction of the widely abducted position by subtrochanteric osteotomy (Figs 197 199) Current modifications of the earlier method of operation include earlier performance of the osteotomy (four to eight weeks after arthrodesis) and elimination of *periods of corrective traction before and after surgery*

Technic.—A Smith Petersen incision is made to the hip joint. Thorough acetabular débridement is done. Cortical bone is removed from the acetabulum and the greater trochanter With the extremity abducted, the denuded surface of the greater trochanter is impacted into the acetabulum Usually 45 degrees of abduction is necessary to accomplish this No attempt is made to secure correct position of function the sole aim is to secure bony union Position is maintained by a hip spica cast applied bilaterally Roentgenograms are made to check position If the fusion site is solid six to eight weeks later on clinical and x ray examination *transverse subtrochanteric osteotomy* is done about 5 cm. distal to the lesser trochanter Position of abduction of 5 10 degrees flexion of 35 degrees and lateral rotation of 10 degrees is obtained and maintained by hip spica. The cast is maintained until the osteotomy site has healed. Weight bearing is resumed gradually and shortening is compensated with a heel lift.

Abduction arthrodesis provided a large area of contact between cancellous bone surfaces with excellent circulation firm apposition and good immobilization favorable to union Important to maintenance of contact at the site of fusion is the axial impaction provided by tightness of the adductor muscles

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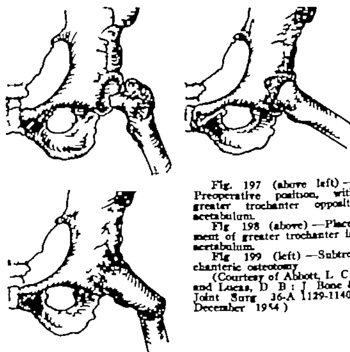


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Experimental Heteroplastic Bone Grafts were studied by P Stagnara T Dubost Perret Le Mer Ag Barone and Valentin[1] (Lyons) From the results it is apparent that assimilation of refrigerated transplants is not equivalent to that of autoplastic grafts

More than 100 implantations of small fragments (auto-homo- and heteroplastic) were made into the cortex of the radius of dogs and histologic studies carried out at intervals Refrigerated homo or heteroplastic bone seemed to present a retardation in assimilation of the order of 1 2 in the best cases and 1 4 in the poorest Lyophilization of both homo- and heteroplastic transplants appeared to reduce this delay to 1 1 in the best cases and 1 2 in less favorable cases

These conclusions based on small fragments cannot be applied with certainty to large grafts Therefore the radii were resected and experimental grafts applied Unfortunately difficulty in immobilizing the dogs and use of metal screws to fix the grafts makes evaluation of results uncertain.

Long Term Results in Human Surgery in Relation to Utilization of Heterogenous Grafts are reported by M Guilleminet[2] (Lyons) Clinical and radiologic follow up was possible on 79 of 81 patients (92 operations) Good results were obtained (apparent complete assimilation of the graft) in 59 (72 8%) There were seven failures (8.6%) classified as such because of nontolerance of the bank bone (suppuration sequestration lysis) and absence of therapeutic effect Four partial failures (4 9%) occurred i e incomplete assimilation of the graft but with conservation of a part of the material and good therapeutic effect Results were doubtful in 11 cases (13 6%) because of radiologic evidence of incomplete assimilation of the graft continuation of the disease process for which the graft was done and absence of recent data on which to base a long term estimate

Two points are important for the effective utilization of refrigerated heterogenous grafts. (1) The graft must be ap-

(1) Rev chir orthop 41 5-34 1955
(2) Ibid pp 35-38

plied to large and deeply opened surfaces of bone preferably by inlay graft (cutting open the medullary cavity of the bone) (2) Rigorous aseptic technic must be followed

Technic of Preparation of Heteroplastic Bone Grafts is described by *T Dubost Perret and L. P Delpy*[1] (*Lyons*) Mass production of heterogenous bone grafts presents technical difficulties that demand careful organization and minute control of all steps in the process

The calf was chosen as the animal donor because at age 9 months cortical grafts as long as 22 23 cm can be obtained with widths up to 3 cm Amputation of the feet is done in an aseptic box equipped with air conditioning and ultraviolet light Dissection is carried out in the same box with entirely sterile conditions by means of slow cuts with a circular saw Any overheating of the edge of the sections during cutting must be avoided Bacteriologic controls and precautions are used during all these procedures only completely sterile grafts are retained The obtaining of totally sterile grafts avoids use of antibiotics in the course of preparation. Systematic bacteriologic verification is the only proof of a perfectly aseptic preparation

The grafts are rapidly frozen in a refrigerator at —70 C for eight hours After freezing the bone is stored at —15 C The grafts must be stored at a temperature below —10 C This necessitates special storage facilities and presents transport problems Use of a Thermos bottle permits 24 hours of transport. However the method does not permit indefinite conservation even with proper temperature control in about six months the fat in the bone specimens shows signs of rancidity and assimilation of the grafts seems to be retarded

The rapid cycles of cryodesiccation recommended for preservation of bone at room temperatures give bad results and produce bone grafts which are too hard and too brittle to be used When the grafts after rapid freezing are desiccated slowly (8-12 days) they present, after rehydration all the characteristics of fresh osseous tissue Thus, though the technic is slow and onerous slow dehydration at low temperatures is necessary to preserve certain physical qualities of bone grafts which are indispensable

(1) Rev chir orthop. 41:2-4 1955

Heterogenous Bone Substitute for Human Bone. During the past decade autogenous bone has gradually been replaced by preserved refrigerated homologous bone in treatment of various orthopedic conditions

Samuel Kleinberg[4] has used beef bone a useful substitute for human bone in many types of operation for more than 30 years It can be used in small and extensive surgical procedures is well tolerated does not excite allergic responses can be conveniently prepared in advance of surgery and may be cut into many sizes and shaped to suit individual needs. For preservation it is kept in a jar filled with 70% alcohol Boiling the graft before use prevents infection In accordance with modern procedures the graft has minimal cortical tissues and maximal cancellous bone Disadvantages of beef bone over autogenous or bank bone are (1) if only cortical bone is used the graft occasionally has to be removed (2) replacement by normal host bone is slower than when autogenous or homologous bone is used

Kleinberg suggests that heterogenous bone should be available in the operating room for use when human bone is not at hand

[Recent workers have shown that bone from young calves, obtained under most careful sterile technics and preserved in blood serum, can be used successfully Preliminary reports stated that the calf bone was as effective in bridging defects or promoting union between fracture fragments in the human patient as was autogenous bone. Bone preserved in this manner would seem to be much better than the old boiled beef bone grafts or pegs.—Ed.]

Comparison of Homologous Bone Grafts Preserved by Acetone and Formaldehyde and by Acetone Alone Experimental Studies Alvina O Sabanas Joseph M Janes David C Dahlin and Fordyce R. Heilman[5] exposed ground bone to a mixture of acetone and formaldehyde and used it to fill defects created in the right femora of eight adult dogs. Bone preserved in acetone alone was deposited in similar defects in the left femora. Roentgenograms gross specimens and histologic preparations were studied at two three four five and six weeks The bone kept in acetone and formaldehyde showed slightly more newly formed osteoid tissue than did that preserved in acetone alone The absence of adverse bio-

(4) Bull. Hosp. Joint Dis 15 169-179 October, 1954
(5) Proc. Staff Meet. Mayo Clin. 30 432-436, Sept. 21 1955

logic effects of formaldehyde on bone is important, because exposure of ground bone to formaldehyde kills contaminating spore forming organisms

Comparison of Homologous Bone Grafts Preserved by Acetone and by Freezing Experimental and Bacteriologic Studies. Alvina O Sabanas Joseph M Janes David C Dahlin and Fordyce R. Heilman[6] used homologous ground bone treated with acetone and ground bone preserved by freezing for grafting defects produced in the femora of dogs A series of x rays was taken The animals were killed at weekly intervals of 1 5 weeks after operation in the first series and 1-10 weeks in the second

Microscopic study in the first series revealed that formation of osteoid tissue in both types of grafts and in the empty control defects began at the periphery of the defects by the end of the first week By the end of the third week the grafts were vascularized and formation of subperiosteal osteoid tissue was at its peak. At the end of the fourth week, there appeared to be more bone in the grafted sites than in the control sites

The findings in the second series of animals corroborated those in the first series In addition the gradual repair of the cortical defect and restoration of bony thickness and density were equal in acetone treated and frozen grafts examined 6-10 weeks after operation

Bacteriologic studies revealed that acetone was able to kill non spore forming micro-organisms in one hour Spore-forming micro-organisms survived but were killed after additional exposure to formaldehyde Bone preserved by this method is easily stored or transported.

Tissue Culture Studies of Bone. Robert D Ray Roscoe Mosiman and Joan Schmidt[7] (Univ of Washington) used several tissue culture methods to determine the viability of cells after storage by freezing

On culture after storage at —78 C for intervals up to 97 days embryonic rat femora lacked the tissue translucence of the controls and were chalky and opaque. Subsequent growth was inhibited and there was no evidence of increase

(6) Proc. Staff Meet. Mayo Clin. 30-422-432, Sept. 21 1955.
(7) J Bone & Joint Surg 36-A 1147 1165 December 1954

in length of frozen femora in any of the cultures Human bone chips both untreated and frozen showed no changes in size after tissue culture Growth was confined to cellular out growth from the explant

No change in the pH (8.3-8 4) of the mediums was observed in cultures of the femora stored for 84 and 97 days at —78 C The medium for culturing human bone was adjusted to the same initial pH and by the third to seventh day of in cubation the pH changed to 7.2 7.6 The change lagged be hind cellular outgrowth and in several cultures did not occur until the seventh day

A halo of cellular outgrowth from the periphery of the embryonic rat femur occurred as early as 24-48 hours after culture The predominant cell in this halo was a typical fibroblast with an elongated nucleus and stellate cytoplasmic processes After being frozen and stored at —78 C for periods up to three months the embryonic rat femora were still viable as evidenced by cellular outgrowth However dele- terious effects were observed after this treatment. Tube cul tures of human adult cancellous bone stored at —78 C for periods up to 77 days revealed that the bone remained viable, but the tissue had apparently been damaged by low temper ature preservation As in the case of embryonic rat bone, the rate of cellular outgrowth was definitely diminished.

Although the frozen embryonic rat femora did not increase in length on culture fibroblastic proliferation was observed. In the zone of ossification there were a few areas of eosino- philic staining matrix where nuclear detail of the cells could be made out. However the cartilage cells in the zones of pro- liferation and vesiculation showed evidence of degeneration, with deeply staining pyknotic nuclei and little or no cyto- plasm

In cultures of fresh human cancellous bone the lacunae of the bone fragments appeared empty cellular growth appar ently originating from the superficial cells The predominant cell type was the fibroblast. Collagenous fibers were present In some areas there was apparent coalescence of the fibrils and the appearance of an eosinophilic matrix resembling the "osteoid seen in "primary bone formation In addition oc casional plasma cells tissue eosinophils macrophages and

lymphocytes were observed. In cultures of human bone frozen and preserved at —78 C before culture, similar cell types as well as osteoid matrix, may be found

The authors demonstrated that when bone is frozen under certain conditions and then thawed and cultured cellular outgrowth occurs and an extracellular matrix is formed with staining characteristics similar to osteoid However it is not likely that this method will be of clinical value until a means can be found to control the tissue reaction which probably occurs in response to homologous grafts of viable bone.

Medullary Nailing and Osteotaxis" are compared by R. Hoffmann[8] (Geneva) whose method of transcutaneous osteotaxis was developed independently of that of Roger Anderson and of Stader The simplicity attributed to medullary nailing is apparent rather than actual as shown by the many accessory instruments designed for this purpose. Osteotaxis on the other hand in which pins fixed in the bone through the skin can be adjusted by ball and socket joints on an ex-

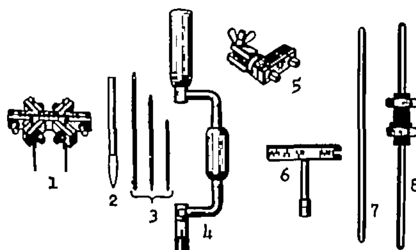


Fig 200.—Instruments used in transcutaneous fixation of fractures (osteotaxis): *1* perforation template, called guide, with four crampons similar to knitting needles attached to it laterally with desired degree of separation in width and, below, desired length *2*, fine-bladed lancet; *3* screw in two calibers, 4 and 3 mm., in cold-drawn steel, with smooth segment which will come at level of upper cortical just when they strike the lower, and which enables them to traverse the bone from side to side without slipping or wedging *4* brace *5* ball-and-socket joint handle *6* T-shaped key, *7* ordinary coupling bar right *8*, sliding coupling bar one half of which, controlled by screws, can slide into other half to shorten instrument and put focus of fracture under "continuous axial pressure." Inversely, bar permits progressive lengthening of limb as "stepped" orthopedic osteotomy It also plays important part in reduction of fresh fractures. (Courtesy of Hoffmann R. Lyon chir 50 309-318 April, 1955)

(8) Lyon chir 50 309-318, April, 1955

ternal coupling bar gives the surgeon full control over reduction and fixation The full armamentarium required is shown in Figure 200 The screws are inserted in two groups one on each side of the fracture (Fig 201), or the operative field if an open procedure is to follow and a short bar insulated against electric shock and provided with a ball-and socket joint is attached to each group These bars called handles are used both to maneuver the fragments and to fix them in

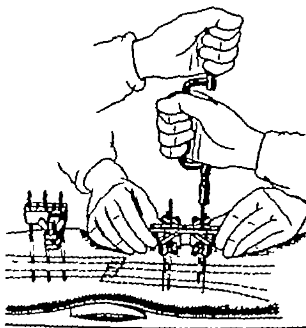
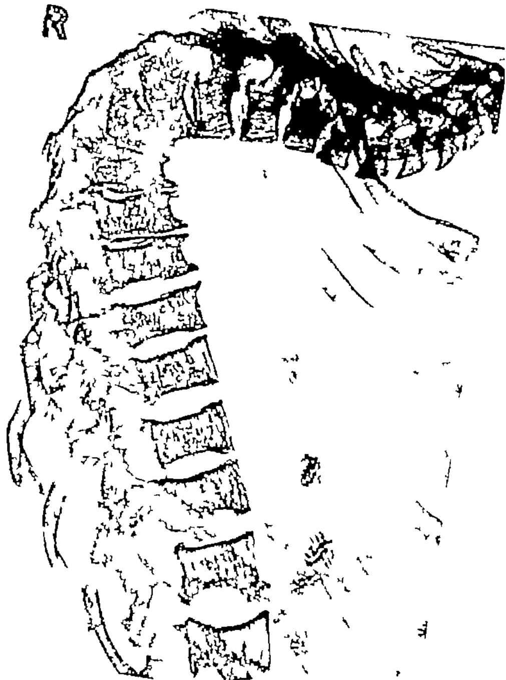


Fig 201 – Placing of second screw (right) and handle in position (left) (Courtesy of Hoffmann R. Lyon Ch 30 309 318, April, 1933)

position as soon as reduction is secured the joints are tightened over the external coupling bar (previously set in place) If the result is unsatisfactory the apparatus can be loosened and the position corrected

Not only is osteotaxis easier than medullary nailing but it affords solid support because the transcutaneous apparatus holds the bone firmly at some distance on each side of the fracture Osteotaxis also has a wider field of application including fractures of the long bones pelvis and mandible, juxta articular fractures which cannot be treated by medullary nailing and in some cases the joints themselves as well


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Avitaminosis D and Renal Osteomalacia. E. Uehlinger[9] (Univ of Zurich) reports detailed clinical and roentgen findings in two cases of osteomalacia A woman 71, had typical clinical evidence of avitaminosis D (Fig 202) caused by poor nutrition and living without sunlight A woman 75 was found to have chronic interstitial nephrosis with acidosis high calcium and phosphorus excretion and hypertrophy of the parathyroid glands X-ray and biopsy findings were identical in both cases There was advanced osteomalacia with skeletal deformity with multiple radiolucent transverse lines (Milkman s syndrome) and typical vertebral lesion—a central zone of osteoporosis and hyperostosis of the marginal zones On the basis of these cases it is concluded that such osteitis fibrosa can originate with or without hyperplasia of the parathyroid glands and therefore that such hyperplasia is not an etiologic factor The findings may result from an attempt to compensate for acidosis but the associations are not clear Blood and urine studies aid in differentiation diagnosis which is important for prognosis and therapy in this condition

Multiple Symmetrical Umbauzonen (Milkman's Syndrome) of Unusual Etiology and Location. A zone of reconstruction can appear in a normal bone after continuous overload or in a bone with a local or generalized lesion after normal use The most common lesion to produce *umbauzonen* (radiolucent bands) by relative overload is osteomalacia. Vitamin D deficiency and several renal diseases may produce osteomalacia. The roentgen appearance is the same regardless of etiology and differentiation is possible only in a clinical sense.

G Leiss[2] (Univ of Berlin) reports a case in which osteomalacia proved by metabolism studies and histologic examination was associated with Recklinghausen s neurofibromatosis X-ray examination showed in addition to the osteomalacia about 30 *umbauzonen* located symmetrically in the skeleton Most of the zones crossed the bones transversely.

(9) Schweiz. med. Wchnschr 85:521 527 May 28, 1955
(2) Fortschr Geb. Röntgenstrahlen 82 15-27 January 1955.

There was no dislocation of the fragments" There was a relative vitamin D resistance which was probably associated with the neurofibromatosis In two other cases the finding is attributed to renal acidosis with tubular insufficiency In these cases there were numerous atypical zones located in former epiphysial lines as well as the usual lesions described above There was no histologic proof in these latter cases b rickets and Sudeck s atrophy must be considered in the diffe ential diagnosis

Disturbances in Calcium and Phosphorus Metabolism With Special Emphasis on Disturbances of Renal Excretion of Phosphates Guido Fanconi[3] states that many regulatory systems play a role in maintaining a normal phosphorus and calcium balance. Integration of all these systems is probably controlled by diencephalic centers Subordinated to these centers is the parathyroid the most important endocrine gland in regulation of calcium and phosphorus metabolism Considerable evidence indicates that the carotid body is the receptor which reacts to very slight changes of calcium and possibly also of phosphate ions in the extracellular fluid and influences secretion of parathyroid hormone.

The most important organs in calcium and phosphorus metabolism are (1) the intestine site of reabsorption of calcium and phosphorus (2) the bones where calcium and phosphorus are combined with carbonates to form hydroxylapatite and (3) the kidneys where glomerular excretion and tubular reabsorption are intimately related

Hyperphosphatemia caused by glomerular insufficiency leads to hyperparathyroidism by way of hypocalcemia. The elevated secretion of parathyroid hormone lowers the tubular reabsorption of phosphates which are secreted in an insufficient amount by the glomeruli and in this way acts against hyperphosphatemia Overwhelming bone resorption takes place leading to hyperphosphatemic renal rickets during the growth period

In recent years kidney disorders have been discovered in which hyperphosphatemia is accompanied by hypercalcemia hyperazotemia osteosclerosis and dwarfism In such cases high calcium phosphorus ratio does not result in osteoporo-

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(3) Metabolism 4 95 106 March, 1955

sis, but in osteosclerosis (Fig 203) The primary disturbance may be in the central nervous system

Phosphates of glomerular filtrate are reabsorbed by the tubules If reabsorption is greatly decreased, hyperphosphaturia and hypophosphatemia develop as in phosphate diabetes if it is greatly increased, it leads to hyperphosphate-



Fig. 203 (left) —Chronic (?) renal hypercalcemia with osteosclerosis.
Fig 204 (right) —Double outlined femoral shaft in infant with hypoparathyroid cretinism.
(Courtesy of Fanconi, G.: Metabolism 4·95-106 March, 1955)

mia as in true hypoparathyroidism (lack of parathyroid hormone) or in Albright s pseudohypoparathyroidism.

Constitutional chronic hypocalcemia uninfluenced by vitamin D was found by Fanconi in infants showing early spasmophilia (during the first weeks of life) and double outline of the femoral shaft (Fig 204) This syndrome is thought to be related to disturbances in central regulation of calcium metabolism

Fanconi observed patients with the primary lesion in the renal tubules resulting in decreased reabsorption of phosphates only (vitamin D resistant rickets with hypophosphatemia) or of phosphates and amino acids and glucose (Debré-de Toni Fanconi syndrome) All these syndromes are most

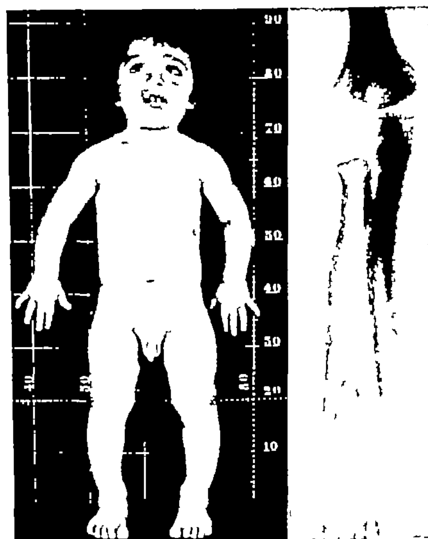


Fig 205 (left) —Familial phosphate diabetes in boy aged 2 years, 10 months. Note massive stature, enlarged epiphyses, saddle nose and Harrison's groove.
Fig 206 (right) —Familial phosphate diabetes in child aged 2. Unquestionable rickets, despite intensive vitamin D therapy
(Courtesy of Fanconi, G Metabolism 4:95-106, March, 1955)

likely due to an impairment of enzyme activity (phosphatases and phosphorylases) involved in the reabsorptive mechanisms of the renal tubules probably in the proximal segment

Most disturbances in reabsorptive mechanisms of the proximal tubules are constitutional and often familial The clinical picture is characterized by hypophosphatemia and hyper

phosphaturia resulting in an osteopathy—either osteoporosis alone or extensive vitamin D resistant rickets (Figs 205 and 206)

Impairment of phosphate tolerance in renal tubular acidosis of Lightwood and Albright has been recently emphasized in explanation of this condition In treatment, administration of basic sodium phosphate should give better results than Albright s mixture

Calcium Metabolism in Health and Disease Calvin H Plimpton[4] (Columbia Univ) states that bone not only gives structural support to the body but also acts as a metabolic reservoir containing 99% of total body calcium 90% of phosphorus and 25% of sodium Calcium is important in neuromuscular physiology and in activating certain enzyme systems such as thromboplastin

Serum calcium tends to be high in hyperparathyroidism when rapidly mobilized from bone and when absorbed in excess It is depressed by high serum phosphate lack of parathyroid hormone or poor absorption

The parathyroids seem to function independently of the pituitary and adrenal glands Low serum calcium level provides their stimulus Parathyroid hormone has a phosphate diuretic action as well as a direct effect on the bones probably through the matrix.

Hyperparathyroidism may be primary (in adenoma or hyperplasia) or secondary due to low serum calcium It may cause bone symptoms (fracture and deformities) kidney symptoms (calculi nephrocalcinosis) polydipsia, polyuria and marked hypotonicity of the muscles Diagnosis is usually on the basis of high serum calcium and low serum phosphorus levels The treatment is surgical removal

Hypoparathyroidism may be the consequence of radical neck dissections for malignancy or due to a traumatic ischemia of the thyroid glands during subtotal thyroidectomy In idiopathic hypoparathyroidism there is fibrosis of the glands of unknown etiology Symptoms are chiefly those of tetany with paresthesias of hands and mouth or with disabling and painful carpopedal spasm Occasionally there is laryngeal stridor and spasm Even grand mal seizures may

(4) M. Clin. North America 39 881-898, M y 1955

develop Therapy consists of high calcium and low phosphorus intake and dihydrotachysterol or vitamin D administration

Renal tubular acidosis is characterized by normal glomerular and impaired tubular function The tubule is unable to manufacture ammonia and put out hydrogen ion This leads to chronic acidosis and to the use of calcium as a fixed base to cover the excretion of anions causing secondary hyperparathyroidism with pseudofractures and renal calculi. Treatment consists of giving another alkali to supply a fixed base.

Malabsorption syndrome is found in a group of diseases where absorption of fat, carbohydrates and sometimes proteins and electrolytes is impaired The predominant feature is usually steatorrhea or symptoms of tetany may be present. Serum calcium level is slightly below normal and the phosphorus is low Malabsorption is probably the commonest cause of osteomalacia

Serum calcium level may be elevated in vitamin D toxicity excess calcium milk and alkali ingestion, immobilization, multiple myeloma metastatic malignancy, sarcoid and acute leukemia as well as in hypoparathyroidism

In osteoporosis the bones have thin trabeculae with little or no osteoid and the serum calcium phosphorus and alkaline phosphatase levels are normal It is seen in immobilization malnutrition scurvy excess cortisone dosage postmenopausal state old age and idiopathic states

Osteomalacia in New York. I Snapper R. Seely S Fall and I Feder[6] (Brooklyn) report four patients in New York City All had fatty diarrhea. In two the steatorrhea was due to chronic jaundice, in one to scleroderma and in one to long standing ileostomy

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becomes seriously depleted of either calcium or phosphorus, the newly formed osteoid does not calcify Therefore, conditions which cause a negative calcium or phosphorus balance ultimately lead to a failure of the second stage of bone formation. If such a situation occurs in the growing child rickets develops In the adult lack of absorption of calcium and phosphorus from the intestine leads to osteomalacia. Normally the adult bone is in a dynamic equilibrium continually a small amount of bone is resorbed and the same amount of bone is laid down

With calcium depletion, a considerable proportion of the skeleton comes to consist of osteoid and the bones are weakened. Bone pains appear, and x rays show generalized demineralization and possibly pathologic fractures The serum calcium and/or phosphorus are low and practically no calcium is excreted in the urine. Later the serum alkaline phosphatase increases

The level of serum calcium and phosphorus is regulated by the parathyroid glands, the secretion of which the parathormone causes bone resorption through dissolution of organic bone matrix. Thus calcium is freed which enters the interstitial tissues of the body Depending on the secondary reactions of the parathyroid glands the serum in osteomalacia may show normal calcium with low phosphorus slightly low calcium with low phosphorus or low calcium with normal phosphorus

The calcium content of the diet plays only a minor role in the causation of osteomalacia irrespective of whether the disease is due to lack of sunshine and absence of vitamin D in the food or whether the disease occurs in the course of prolonged fatty diarrhea. Treatment should consist of parenteral vitamin D administration and radiation with ultraviolet light.

Osteoporosis—Commonest of All Diseases? W P U Jackson[6] (Univ of Cape Town) states that osteoporosis does not arise primarily as a disorder of calcium and phosphorus metabolism but rather as a deficiency in the continued formation of the protein matrix of bone by osteoblasts on which bone salt is deposited Normally in adult life bone deposition and resorption are equal.

Osteoporosis is a true atrophy of bone tissue Often by the

(6) South African M. J 29 885-890 Sept. 17 1955

time atrophy has proceeded to a clinically important degree daily calcium output is well within normal limits or even below normal Apparently the total bone mass has been so reduced and the calcium turnover so diminished that a balance is re-established at a new thin bone level

In osteoporosis decalcification is most pronounced in the spine bones of the trunk pelvis ribs sternum and upper portions of the femora The skull, long bones feet and hands are involved later and to a lesser degree. The lamina dura of the teeth remains intact there are no cysts or pseudofractures The vertebral bodies become radiolucent the trabeculae may stand out but they are not coarsened and the outlines appear penciled in The disks expand into the adjacent bodies the vertebrae become variably biconcave, with partial fractures of the vertebral plates or compression fractures The whole spine becomes squashed leading to kyphosis and loss of height Pain is variable and may be local referred or of root distribution Total incapacity may occur Fractures may occur in other affected bones A fractured neck of the femur is by and large a pathologic fracture due to osteoporosis.

The porosis of elderly men is probably similar with regard to hormone deficiency to the porosis seen in women after menopause It is treated with testosterone with enough estrogen added to prevent sexual overstimulation Estrogens are used in postmenopausal women

Idiopathic osteoporosis occurs in young men or premenopausal women and seems to be commoner in men There are no clues to the cause in men and no satisfactory treatment.

Senile Osteoporosis Physiologic Basis of Treatment is discussed by Marc Moldawer[7] (Harvard Med School) Senile osteoporosis a physiologic condition in which bone production is less than bone resorption appears to be due to deficient osteoblast stimulation Calcium metabolism and serum levels of calcium phosphorus and alkaline phosphatase are normal urine calcium tends to be increased and is an index of the degree of activity of the process One of the main etiological factors is a relative preponderance of antianabolic over anabolic hormones

Theoretically the efficacy of therapy can be assessed by

(7) A M A Arch I t Med 96 20-214 August, 1955.

radiological changes symptomatic improvement repeated biopsies studies with radioisotopes of calcium or by calcium balance studies but to date only the calcium balance studies have proved to be a useful index

Therapy should consist of analgesia and rapid mobilization in cases of acute symptomatic fracture. In all cases continued mobility should be obtained and muscle strengthening exercises used Long term maintenance is recommended on a high protein diet with up to 1 000 mg calcium/day with B vitamins and ascorbic acid if desired but without vitamin D Women should be maintained on estrogen with testoster one given initially and up to the point of masculinization men on androgen with estrogen given initially and until feminization becomes disturbing Continued combined an drogen and estrogen therapy may be desirable in both men and women when osteoporosis is severe and general debility is present

Prolonged immobilization is to be avoided in patients with osteoporosis and in elderly patients in general

Estrogen in Bone Repair Clinical observations indicate that both estrogens and androgens are of value in correcting postmenopausal or senile osteoporosis including instances complicated by fracture or other skeletal diseases To investigate the subject further William L. Moffatt and William C Francis[8] (Springfield Mo) studied the influence of diethyl stilbestrol on the healing of experimentally produced frac tures in both normal and castrated female rabbits This drug is one of the most potent of all the synthetic estrogens in stimulating the production of endosteal bone

Diethylstilbestrol (in Persic oil) delayed bone repair in both castrated and control rabbits The effect appeared to be more pronounced in the castrated animals which showed an excessive amount of poorly developed callus about the fracture sites The delay appeared to be due to retardation in the calcification rather than in the formation of osteoid tissue

Prolonged diethylstilbestrol administration increased en dosteal bone formation at the fracture site and later inhibited the resorption of this endosteal bone

(8) Surg., Gynec. & Obst. 101:311 316, September 1955

Case of Fluorosis is reported by T Fichardt J L Van Rhyn and G W Van Selm* (Pretoria, Union of South Africa) Fluorosis is characterized by nondestructive, generalized osteopetrosis of the skeleton associated with dental mottling and spicular bony deposits at the sites of muscle insertions and ligamentous attachments that lead to multiple stiff joints and a poker spine and is caused by drinking water that contains fluorides in excess of 1 ppm over long periods

Bantu man 60 hospitalized for pain in the left loin and over urinary bladder and frequency who had obtained drinking water for 20 years from a borehole containing 11.78 ppm fluorides, noticed advancing stiffness of neck and back and especially of hip joints during the last few years Urine showed 3+ albumin. Cystoscopy revealed a small contracted and infected urinary bladder X ray pictures of the skeleton showed generalized osteosclerotic changes affecting all bones, giving them a massive homogeneous granular appearance with fluffy margins and complete loss of bony architecture. The proximal bones were more involved than the distal The teeth showed an advanced stage of "mottled enamel"

Prolonged ingestion of water with high fluoride content differentiated the condition from such other osteosclerotic conditions as Albers Schonberg s disease sclerosing carcinomatous metastases osteitis deformans osteomyelosclerosis and Camurati Engelmann dystrophy

[There has been some controversy among physicians and public health officers with regard to the advisability of fluoridization of the drinking water of entire communities in an effort to prevent tooth decay Some of those who claim to be authorities on the subject are skeptical of the value of fluoridization, despite numerous reports which were enthusiastic in announcing that this substance prevented tooth decay Others have claimed definite injury to other body tissues as a result of the fluoride content in the drinking water This case report is one of several that have appeared within the past two or three years relating damage to the human skeleton, characterized by osteopetrous and, in some instances, dental mottling, to prolonged drinking of water that contains fluoride in excess of 1 ppm. These case reports may be completely atypical, and the etiology of the bone changes may not be correctly assumed, but they do demand a re-evaluation of the effect of fluoride in drinking water —Ed.]

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(9) J Fac. Radiologists 7 130-135 October 1955

Skeletal Fluorosis (Paraplegia) is discussed by S Venkateswara Rao[1] (Hyderabad India) Fluorosis is intoxication with fluorine Chronic fluorosis is characterized by (1) mottled teeth particularly in children, (2) bone conditions including osteosclerosis and periosteal reactions (3) wide spread calcification of osseous ligaments of the long bones spine, etc., and (4) synostosis of various joints, especially of the spine. Clinically, manifestations are 'stiff back and joint pains Neurologic symptoms are due to pressure on the cord and nerves by skeletal deformities as seen in the following case.

Man, 45 was hospitalized because of tingling and numbness of both lower extremities with loss of power of 1½ years duration. On set was insidious. His wife had been suffering from joint pains of both knees and "stiff back" for the last three years

Physical examination revealed very poor motor power in the lower legs, with marked rigidity Gait was spastic. Knee and ankle reflexes were exaggerated and bilateral ankle clonus was present. Cerebellar function and sensation were normal The spine was stiff in the dorso-lumbar region but without tenderness. Serology and blood picture were normal X ray pictures of the ribs, long bones, carpal bones spine and pelvis showed osteosclerosis and calcification of the anteri or and lateral intervertebral ligaments

The diagnosis of skeletal fluorosis was made on the following grounds (1) the patient was drinking well water with a fluorine content about seven times higher than normal (2) the urine and blood contained a high amount of fluorine, and (3) there was x ray evidence of widespread osteosclerosis. The paraplegia was thought to be due to compression of the cord by skeletal fluorosis

New Observation in Case of Hyperostotic Osteopathy of Engelmann-Camurati is reported by H Weingraber[2] Hyperplastic periostitis a hereditary systemic disease first de scribed in 1929 by Engelmann and Camurati is characterized by bone marrow fibrosis anemia, leukocytosis and increased sedimentation rate. Roentgenologically there are symmetri cal generalized diaphysial thickenings with periosteal sclerosis and irregular cortical reconstructions which produce narrowing or enlargement of the marrow space

Boy 4 had the typical clinical findings and symptoms of this dis

(1) J. Indian M. Profession 2 780-783 September 1955.
(2) Fortschr Geb. Röntgenstrahlen 81 800-804 December 1954



Fig 207 Spindle-shaped thickening of diaphysis of femure with fresh periosteal reaction lattice like reconstruction of structure of compact bone and changes in bone marrow (Courtesy of Weingraber H Fortschr Geb. Röntgenstrahlen 81:800-804 December 1954)

case In addition to the usual roentgen changes, there were fresh areas of periosteal new bone dissociated from the compact bone by a small space (Fig 207) Follow up examinations showed consolidations of the older periosteal reactions followed by recurrent appearances of new reactive bone

These findings suggest that the process may be a chronic periostitis combined with a progressive marrow fibrosis.

Syndrome of Acute Anterior Spinal Cord Injury is described and reported in 13 patients by Richard C Schneider[3]

(3) J Neurosurg 11 95 1 March 1955

(Univ of Michigan) It is characterized by an immediate complete paralysis below the site of the lesion with hypalgesia and hypesthesia to the level of the lesion and with preservation of motion position and touch and some vibration sense In only one patient was the syndrome not present immediately but it evolved rapidly within a few hours It may be caused by acute anterior spinal cord compression or destruction of the anterior portion of the cord

It is impossible to differentiate those patients who are suffering from anterior cord compression by a lesion with the restriction of posterior cord displacement by the dentate ligaments from those who have anterior cord destruction Therefore, early operation is advisable with section of the dentate ligaments and inspection of the interspaces for a surgical lesion In general myelography is contraindicated in this group of patients for fear of causing further damage to the already injured spinal cord

Experience showed that early operation is indicated to prevent prolonged anoxia caused by direct anterior spinal cord compression or possible compression of the anterior spinal artery Decompression with removal of three laminae is necessary to permit sufficient space for section of dentate ligaments at two or three levels and exploration anterior to the cord

Some patients may recover some degree of function spontaneously from anterior cervical spinal cord compression However there is always danger of chronic arthritic spurring at the level of the fracture-dislocation causing chronic anterior cord compression and resulting in spasticity requiring operation at a later date. Therefore it is advisable to operate on these patients early to decompress the cord and permit it to ride freely over any bony defect

Place of Nerve Grafting in Orthopedic Surgery is reported by Donal Brooks[4] (Inst of Orthopaedics London) in 93 patients in whom it was used to restore continuity of a nerve. All patients with pedicle nerve grafts made excellent recovery Results of sciatic nerve grafting were poor and those of digital nerve grafting uncertain all other forms gave useful recovery in over 50% of the patients

The most important single factor contributing to success

(4) J Bone & Joint Surg 37 \ 299-305 April, 1955

of a nerve graft is adequate revascularization of the graft In grafts of large diameter, such as those of the sciatic nerve, rapid revascularization rarely occurs If, however, pedicle nerve grafting is employed, survival is assured In cable and digital grafts, conditions for revascularization must be as favorable as possible. In the forearm this is relatively simple, for the grafts can be surrounded by vascular muscle bellies In the hand with a limited amount of subcutaneous tissue and surrounded by the long flexor tendons, conditions for survival of a free graft are poor In digital nerve lesions, the digital vessels are often injured at the same time, which may occasionally cause an ischemic lesion of the distal segment of the nerve

Constriction Pain in Muscle Ischemic or Neural? Michael Kelly[5] (Melbourne Australia) found that pain develops in fatigued muscles with a free blood supply whose nerve supply is partially blocked and does not develop readily if the nerves are left free although circulation is occluded This indicates that so-called ischemic pain which occurs if muscles are exercised while the blood supply is arrested is not due to ischemia

Fatigue develops in the muscles then pain Fatigue is a definite muscular sensation which when intensified progresses to aching pain While dissecting a cadaver Kelly wore tight rubber gloves which hindered finger movements Weakness of the fingers developed and progressed almost to paralysis and fatigue in the forearms progressed to an intolerable ache resembling ischemic pain exactly

When a limb is constricted it becomes generally hyperalgesic, skin becomes hyperesthetic and deep wounds become more painful Heat adds to hyperalgesia to give stinging cutaneous pain Similarly hyperalgesic spots in muscle become painful by summation when the nerve is compressed. If a working muscle is substituted for a hyperalgesic spot, subthreshold is raised to threshold by compression of the nerve. Muscular fatigue is therefore a subthreshold condition analogous to hyperalgesia it becomes pain when it is intensified by partially blocking the nerve supply

(5) Neurology 5 178 181 March 1955

Suppression of Paget's Disease with ACTH and Cortisone is discussed by Fuller Albright and Philip H Henneman[6] (Harvard Med School) In Paget's disease there is an increased mass of bone of poor structural quality (mosaic pattern) but of highly increased metabolic activity and vasculature Bone destruction and bone production are both increased

The authors found that prolonged administration of ACTH or cortisone, in large doses to patients with marked Paget's disease may cause a fall in serum calcium and phosphorus An immediate drop in urinary calcium excretion later returns to control levels, only to fall again when the drug is discontinued Furthermore a late fall in serum alkaline phosphatase may occur

Serial skull biopsies of eight patients so treated revealed that the drugs may cause changes consisting of disappearance of osteoblasts and osteoclasts altered appearance of collagen fibers and replacement of fibrous marrow with fat and hemopoietic cells Since Paget's disease is irregularly distributed many more biopsies will be necessary before the histologic response is clearly defined

ACTH and cortisone may cause striking decreases in cardiac output and mild to marked clinical improvement in patients with severe Paget's disease.

Serum Sickness and Local Reactions in Tetanus Prophylaxis Study of 400 Cases N H Moynihan[7] (St Thomas's Hosp London) found 401 (5.3%) reactions among 7 580 patients given tetanus antitoxin in prophylactic doses The reactions were commonest in children tailing off gradually as age advanced

Anaphylactic shock was seen in two patients In the present series 362 patients were known to have had one or more previous injections and none of these had an anaphylactic reaction

Local reaction at the site of injection was the commonest complication seen in 205 patients (2.7%) It occurred most frequently on the sixth to seventh day after injection and consisted of local edema erythema and urticaria, with burn

(6) Tr A. Am. Physicians 68.238-246, 1955
(7) Lancet 2:264-266, Aug 6, 1955

ing and itching of the skin about the site of the puncture and often involving the sensitivity test site also In 53 patients it was the forerunner of a serum sickness reaction

Serum sickness (192 patients) is caused by precipitins developing before the antitoxin administered has disappeared from the body It may even occur—as in 10 patients of this series—after a "positive" sensitivity test dose of 1 minim It may be evident as soon as two hours after injection or may not appear until as long as 26 days later the variation in this series being from 3 hours to 18 days The chief symptoms were urticaria pyrexia, malaise lymph gland enlargement and edema of the face. Incidence of serum sickness was about twice as frequent in patients who had a previous prophylactic dose As with local reactions antihistamines usually led to cure in two to four days

Despite improvement in methods of purifying and refining the serum the problem of serum reactions is still important

Traffic Injuries—A Surgical Problem. Richard W Zollinger[8] (Ohio State Univ) surveyed 9 059 emergency room visits to Mt Carmel Hospital Columbus in 1953 8% of emergencies were due to traffic injuries and 8.3% of all patients required hospitalization Of the traffic victims 25% were hospitalized Over 70% of all traffic injuries were treated between noon and midnight. The hours of dusk and darkness were the most dangerous times to travel Fewest injuries occurred in winter and the most in fall. Most traffic injuries were lacerations contusions and abrasions The head was involved in 42% In 21 patients death occurred so rapidly and from such severe injuries that no definite treatment could be instituted.

Any physician responsible for emergencies must be familiar with technic of resuscitation including management of shock and establishment of adequate airway which may require emergency tracheotomy He must have a knowledge of head thoracic and abdominal injuries which account for the largest percentage of fatalities

Pneumatic Tire Torsion Avulsion Injury This type of injury occurs when the skin of a limb is torn from its deeper structures by being trapped between the tire of a vehicle and

(8) A.M A. Arch Surg 70 694-700 May 1955.



Fig. 208 (top) —Primary avulsion injury preoperatively
Fig. 209 (center) —Primary avulsion injury postoperatively with full take of grafts.
Fig 210 (bottom) —Primary avulsion injury before delayed treatment.
(Courtesy of Prendiville, J B. and Lewis E. Brit. J Surg 42 582 587 May 1955.)

the road J B Prendiville and Emlyn Lewis[9] report on 40 children and 10 adults all but 3 with the lower limb affected. All required skin grafting or flap repair

Suitable pressure dressings with immobilization and elevation of the limb, is the best emergency treatment of the severely injured limb It controls hemorrhage rests damaged tissues and prevents infection Blood transfusion and oxygen therapy with antibiotics antitetanus and antigas-gangrene serums are essential At surgery the wound is cleansed, and all devitalized tissues are excised The authors suggest that repair of the defect be done as a secondary procedure a week later Neglected lesions are usually unsuitable for immediate surgery If the lesion is heavily infected antibiotics locally are indicated If the granulations are not suitable they may be curetted from the fibrous base and grafting performed on this layer

Late results of pneumatic tire avulsion injuries are contractures unstable surfaces that have healed by scar epithelium and deformities in the outline of the limb caused by absence of subcutaneous tissues and fat

CASE 1 —Boy 6 hospitalized two hours after being run over by a bus was in shock. Due to general condition exploration of the wounds could not be carried out for 24 hours during which time he received 4 pt. of blood

Operation disclosed extensive avulsion injuries to left upper and lower limbs with full extent of the skin of the thigh completely avulsed and badly injured (Fig 208) The underlying fascia and muscles were disrupted, and the knee joint was widely opened. The full extent of the skin from the pelvis to below the knee was excised. General debridement of the underlying fascia and muscle tissue was carried out and pressure dressings and a shell of plaster were applied.

The skin of the left arm was intact but severely injured and avulsed from the underlying tissues. On exploration the brachial artery was found divided and was ligated. Pressure dressings and plaster were applied

Skin grafting was carried out one week later and a full take of the grafts was obtained (Fig 209)

CASE 2 —Girl 6 was hospitalized five days after she was run over by a bus When blood transfusion had increased hemoglobin values to 86% the injuries were explored. The right thigh showed an extensive area of gangrene extending from the knee to the pelvic region. The pelvis was fractured and the vagina lacerated (Fig 210)

(9) Brit. J Surg 42 582 587 May 1955

Excision of the sloughs was performed, and the vagina was repaired. Pressure dressings were applied and skin grafting was done on two subsequent occasions.

Morquio s Disease is easily diagnosed when kyphoscoliosis of the cervical or lumbar spine is associated with changes of the pelvis and long bones However as Arthur Lipschutz[1] (Hahnemann Med College) points out it is difficult to recog-

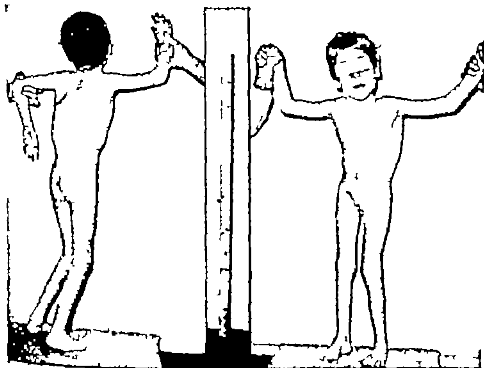


Fig 211.—Girl, 7 with marked kyphoscoliosis of dorsolumbar spine, could support herself in a walker but was unable to walk unaided. (*Courtesy of Lipschutz, A.: J Pediat.* 46:403-414 April, 1955)

nize atypical forms He reports on a brother and sister presenting atypical types of the disease.

Girl 7 was found to have a lump over the lower spine when 10 months old and a kyphoscoliosis of the dorsolumbar spine five months later At 15 months, her skeletal age was 9 months and she did not walk. She had hypotonicity of the extremities, was mentally retarded and showed generalized underdevelopment of the vertebral bodies and bones of the pelvis

At age 4 x ray films revealed the acetabular cavities flattened bilaterally Forearms and elbows showed delay in osseous develop-

(1) J Pediat. 46 403-414 April, 1955

ment, and there was generalized demineralization of the femurs, tibias and their epiphyses. The bodies of the dorsal and lumbar vertebrae were flattened some were wedge shaped, with widening of the intervertebral spaces. These changes were compatible with Morquio's disease the minimal long bone changes characterized it as an atypical type.

At age 7 years and 8 months she had a marked gibbus, atonic extremities, bilateral clubfoot and marked malocclusion of all teeth. She was apathetic listless and appeared mentally retarded (Fig 211)

Both the girl and a younger brother had universal vertebra plana and kyphoscoliosis below the 10th dorsal vertebra. Both showed definite acetabular changes with irregularities of development of acetabular and bilateral coxa vara of classic Morquio's disease But the long bones were not remarkable except for rather tubular and narrow appearance, and there was no real abnormality of the hands wrists elbows knees or ankles

Osteopetrosis in Adults C L Hinkel and D D Beiler[2] (Danville Pa) observed osteopetrosis in five adult siblings one woman and four men In adults the course is clinically benign and hematologic and neurologic findings are minimal or absent Long bone clubbing medullary narrowing and foramen encroachment are not prominent The disease may be asymptomatic

The disease probably develops as the result of a hereditary trait which is governed by one or more genes of intermediate dominance. The essential defect appears to be inherent in the mesenchyme which is the common ancestor of hematogenic and osteogenic cells In siblings the type and distribution of bone changes are highly characteristic of the family There may be however considerable variation in time of onset and in severity of the disease The disease was not observed in the children or grandchildren of these patients

The increase in density results from faulty resorption of endosteal and periosteal bone and matrix Cartilage cells and unresorbed matrix are found in the bones of adults as late as the seventh decade Osteopetrotic bones are increased in weight fragility and mineral ash content. In patients of this age the dense inclusions are probably not viable

(2) Am. J Roentgenol. 74 46-64 July 1955

X ray findings are characteristic The disease may involve endochondral or membranous bone and may include primary and secondary ossification centers The distribution in the authors patients was widespread Some bones were completely spared whereas others were only partially affected Measurement of the central nidi (of normal density) in the osteopetrotic inclusions permits estimation of the time of onset in certain bones On this basis the authors believe that the time of onset in their patients ranged from the prenatal period to about age 4

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